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WAR MACHINE

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Armed Forces of the World: US Rapid Deployment Force

Air War over the Lebanon 1982

A fully illustrated guide to the World's Modern Fighters

WAR MACHINE

Volume 1 **Issue 5**

CONTENTS

Modern Fighter Aircraft

Panavia Tornado ADV 82
Saab JA37 Viggen 82
Missions of Tornado F.Mk2 83
Dassault-Breguet Mirage III/5/50 series 84
Dassault-Breguet Mirage F.1 85
Dassault-Breguet Mirage 2000 85
IAI Kfir 86
Air War over Lebanon 87
McDonnell Douglas F-15 Eagle 88
General Dynamics F-16 Fighting Falcon 88
F-16 Fighting Falcon in Action 89
Northrop F-5E/Tiger II/F-20 95
Yom Kippur Air War 96
McDonnell Douglas F-4 Phantom II 97
Mikoyan-Gurevich MiG-21 'Fishbed' 98
Mikoyan-Gurevich MiG-23 'Flogger' 98
Mikoyan-Gurevich MiG-25 'Foxbat' 99
Sukhoi Su-15 'Flagon' 100
Tupolev Tu-128 'Fiddler' 100

Armed Forces of the World

US Rapid Deployment Force (Part 1) iii

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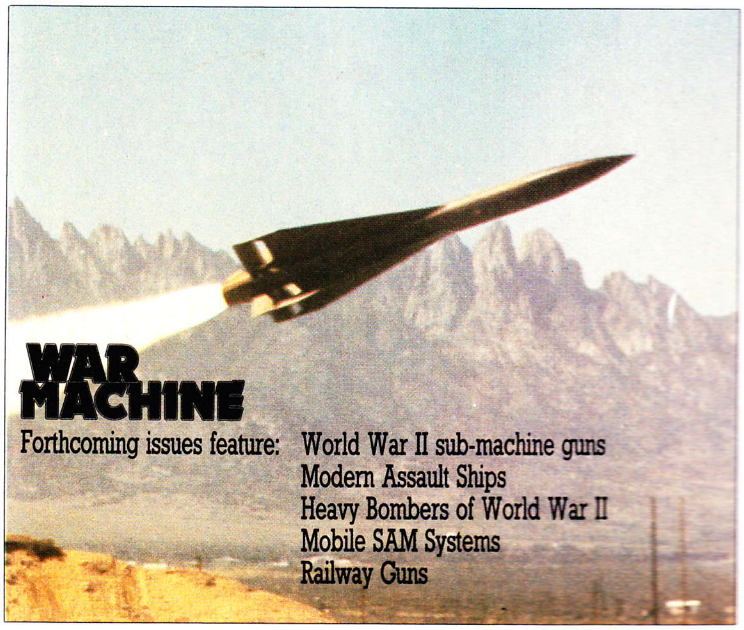

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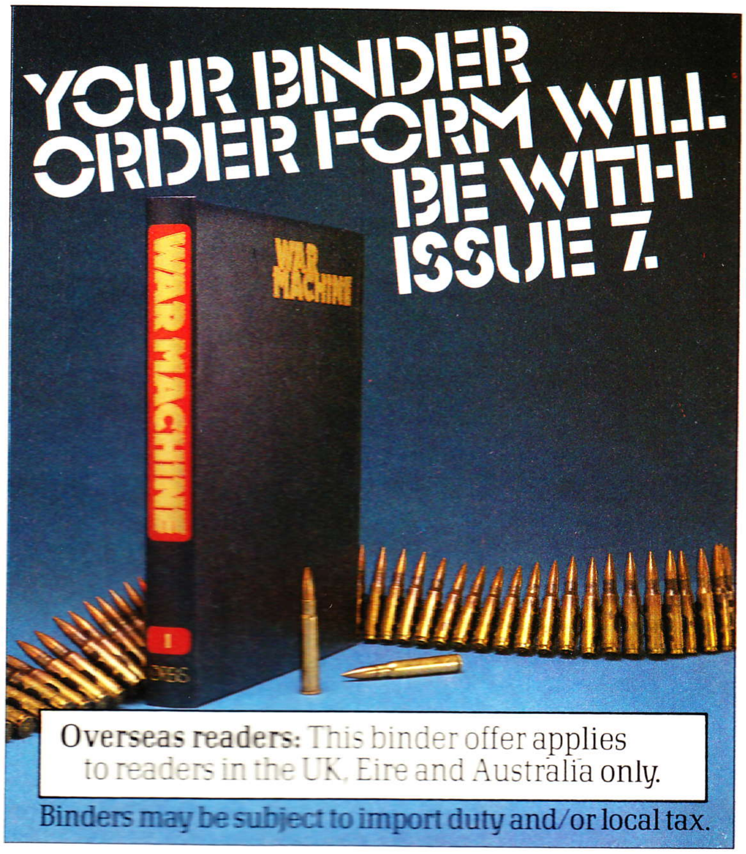

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Modern Fighter Aircraft

A superb range of new-generation high-technology fighters have recently taken to the skies: not simply aircraft that can fly a few miles higher or a little faster than before, but wholly new concepts, highly equipped with computerized flight, target acquisition and fire control systems. Here we review the land-based fighters of today.

The Tornado ADV (Air Defence Variant) shows off its deadly pack of four Sky Flash missiles. Unlike much more agile new-generation fighters such as the F-15 and F-16, the Tornado ADV is designed to patrol for hours on end far out over Britain's northern and western approaches and to intercept and destroy enemy aircraft attacking NATO's shipping lanes and land targets.

Fighter-interceptor, strike-fighter and fighter-bomber: where does one category end and another begin? Such a question is more easily asked than answered, for whilst some aircraft are designed for a specific role, others are capable of all three, or have alternative tasks allocated to them when they are no longer capable of meeting an opponent's top-line fighters on equal terms. Traditionally, however, the fighter is an interceptor: a lightweight, agile, highly-tuned combat machine totally dedicated to out-distancing and out-manoeuvring any aircraft it is likely to meet and, in recent times, of destroying it with cannon or an air-to-air missile.

This definition has not always found acceptance with air force requirements branches throughout the world, and periodically the 'dogfighting' concept has been abandoned in favour of the heavier, all-weather or long-range interceptor until a fresh conflict confirms once again the need for agility. New technology has enabled designers to develop single-seat fighters with many of the capabilities of their weightier companions, but the gap has not yet been closed fully, so twin-seat, twin-engine interceptors will remain in front-line service for the foreseeable future. The General Dynamics F-16 Fighting Falcon can fly rings around any opponent, though unlike the heavier Panavia Tornado F.Mk 2 it is unable to loiter for hours at great distances from its base, then shoot down an intruder 40 km (25 miles) away after a low-level pursuit at speeds which would shake any other aircraft to pieces.

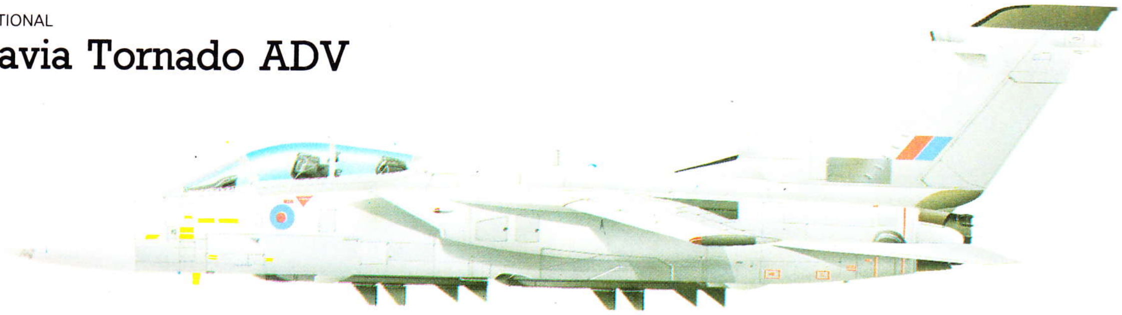
Whereas specialized ground-attack aircraft have been augmented in the past by new fighters which have failed to meet expectations or by those replaced as interceptors by more modern equipment, many fighters now in service or production have been conceived as dual-role aircraft. With advanced multi-function avionics, fighters of the McDonnell Douglas F/A-18 Hornet class are equally in their element in combat with opposing aircraft or delivering ordnance with pinpoint accuracy on a surface target. Such versatility is difficult to achieve without unacceptable compromises, but the dividends are great in terms of cost-effectiveness. This is particularly true of naval aircraft, where numbers are limited by space restrictions aboard even the largest carriers, although in an overland battle it is clearly advantageous to possess a fighter which can repel an attack and then turn swiftly to strike operations for the counter-thrust. For a proven example of this assertion, it is necessary to look no further than the BAe Sea Harrier's record in the Falklands war of 1982.

Increasingly, therefore, the fighter will be both interceptor and ground-attack/strike aircraft, in approximately equal proportions so far as technology will permit, and in this sense the wheel will have turned full circle since aircraft first went to war against each other in 1915. Other similarities exist with the frail combat machines of that earlier age, for the fighter-interceptor remains the principal driving force of aircraft and avionics development, striving as always for the extra knot of speed, the tighter turning circle and the lighter yet stronger airframe. Flown by an elite band of fit and alert airmen, the world's fighters are the man-made eagles of the sky: supreme in their element, powerful, graceful, swift to attack and formidable in defence.

The McDonnell Douglas F-15 Eagle is widely regarded as the best fighter in the world, though it has disadvantages of great size and high operating costs. Unlike the otherwise superb F-16, the F-15 enjoys far greater long-range high-altitude kill capability.

INTERNATIONAL

Panavia Tornado ADV



Designated Tornado F.Mk 2 in service with the RAF, the ADV had to be made longer than the original IDS version to accommodate the new Foxhunter radar and four Sky Flash missiles.

At the start of the Tornado programme it was expected that air-combat fighting would be a role, but the dominant requirement of the customers was long-range interdiction and other surface-directed roles (though with Radpac software and changed weapons fighter capability is considerable). The RAF alone raised a requirement for a long-range all-weather interceptor to patrol the vast airspace for which the UK is responsible (from Iceland to the Baltic), replacing the Lightning and later the Phantom, and 165 are being bought for RAF Strike Command. First flown on 27 October 1979 the **Panavia Tornado ADV** (Air-Defence Version), designated **Tornado F.Mk 2** by the RAF, has proved to have performance beyond prediction. The new Marconi/Ferranti Foxhunter radar can pick individual targets at over 185 km (115 miles) and track several targets simultaneously, and the longer radome gives enhanced transonic acceleration. The fuselage was lengthened to accommodate tandem pairs of recessed missiles (the BAe Sky Flash, with a range of more than 40 km/25 miles and the ability to snap down on targets as low as 75 m/245 ft despite ground clutter and electronic countermeasures), and this also increases internal fuel so that in a demonstration an unrefuelled sortie was flown lasting 4 hours 30 minutes, with 2 hours 20 minutes patrol at a radius of 374 miles (602 km) with full armament. Other avionics features of the Tornado F.Mk 2 are ESM (electronic surveillance measures), ECCM (electronic counter-countermeasures) and an ECM-resistant data link. By 1983 the RAF had placed orders for 70 of the 165 required and these will enter service from 1984. Performance in all respects has been so outstanding that further customers are confidently predicted, possibly including the existing Tornado IDS users.

Specification:
Tornado F.Mk 2
Type: long-range all-weather interceptor
Armament: one 27-mm Mauser gun; four Sky Flash (later AMRAAM) medium-range AAMs plus two AIM-9L Sidewinder (later ASRAAM) short-range AAMs
Powerplant: two 7258 kg (16,000-lb) thrust Turbo-Union RB.199 Mk 103 augmented turbofans
Performance: maximum speed over 2414 km/h (1,500 mph) or Mach 2.27 at high altitude; climb to 9150 m (30,000 ft) in 2 minutes; service ceiling more than 15240 m (50,000 ft); patrol radius over 644 km (400 miles) with 2 hours on station plus 10 minutes of combat
Weights: empty 14000 kg (30,865 lb); maximum take-off more than 27270 kg (60,020 lb)
Dimensions: span (swept) 8.6 m (28 ft 2½ in); length 18.06 m (59 ft 3 in); height 5.7 m (18 ft 8½ in); wing area not stated

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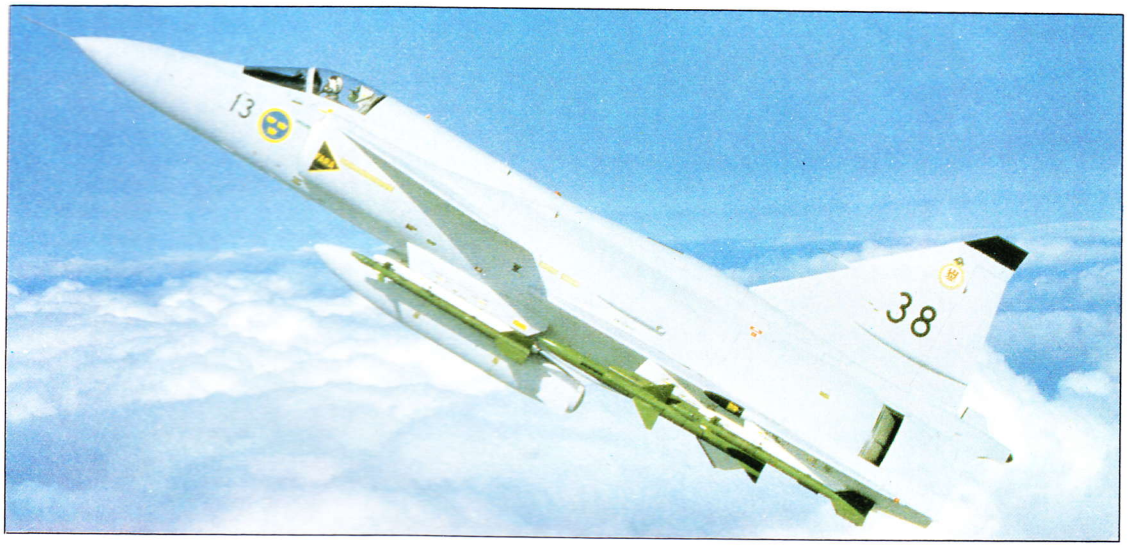
SWEDEN

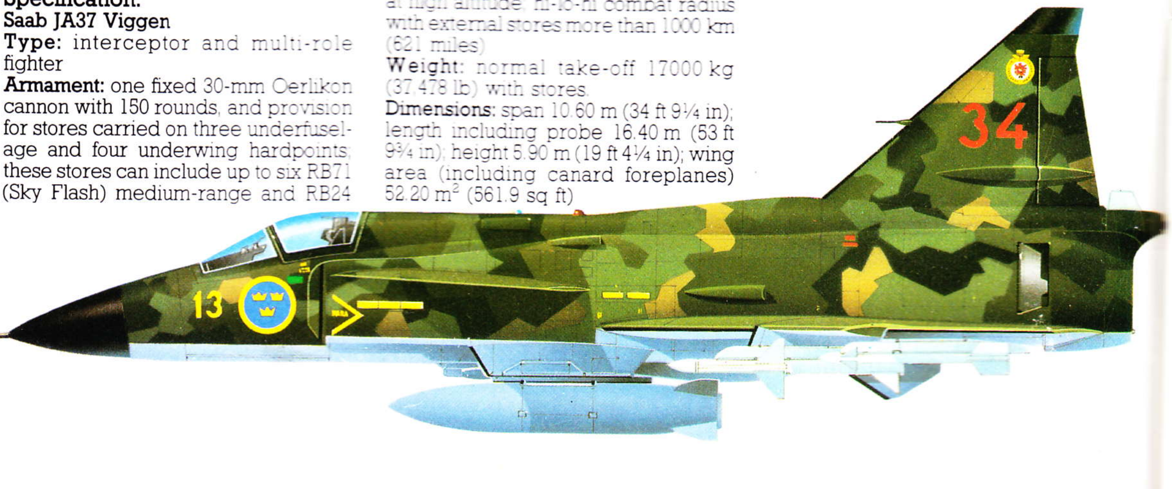
Saab JA37 Viggen

When Sweden planned its next-generation combat aircraft, System 37, in the early 1960s the most urgent need was for attack and multi-sensor reconnaissance versions to replace types such as the Saab 32 Lansen, Saab 35 Draken and Saab 105. A total of 180 of these models, the AJ37 attack aircraft, SF37 and SH37 overland and overwater reconnaissance platforms, and SK37 trainer, were delivered by 1981. By this time production was centred on the **Saab JA37 Viggen** interceptor, which uses the same airframe (except for having the extra swept tip to the fin first seen on the SK) but has totally new sensors (including L.M. Ericsson UAP-1023 pulse-Doppler high-performance long-range radar feeding information to a Singer-Kearfott SKC-2037 digital central computer, which in turn keeps the pilot in the picture by means of a Smiths head-up display) and weapons, including the high-velocity Oerlikon KCA 30-mm cannon, whose shell has a very flat trajectory and a kinetic energy after a flight of 1500 m (1,640 yards) equivalent to that of a DEFA or Aden cannon (of the same calibre) at the muzzle. Even the engine has different fan/compressor blading and other changes to increase thrust, and like other versions has a giant afterburner and thrust reverser for pulling the aircraft up quickly. STOL operations, facilitated by the canard configuration, are routinely made from straight stretches of country highway, with no-flare landings on the tandem-wheel main gears, in order to prevent the squadrons being destroyed on their fixed air bases. The Swedish Flygvapen (air force) ordered 149 to equip eight squadrons over the period 1979-85. The JA37 was the first fighter in any part of Europe to enter service with an advanced pulse-Doppler radar, and its avionics and displays are representative of the very latest practice and are also compatible with the delivery of air-to-surface weapons, giving the type a very useful secondary attack capability.



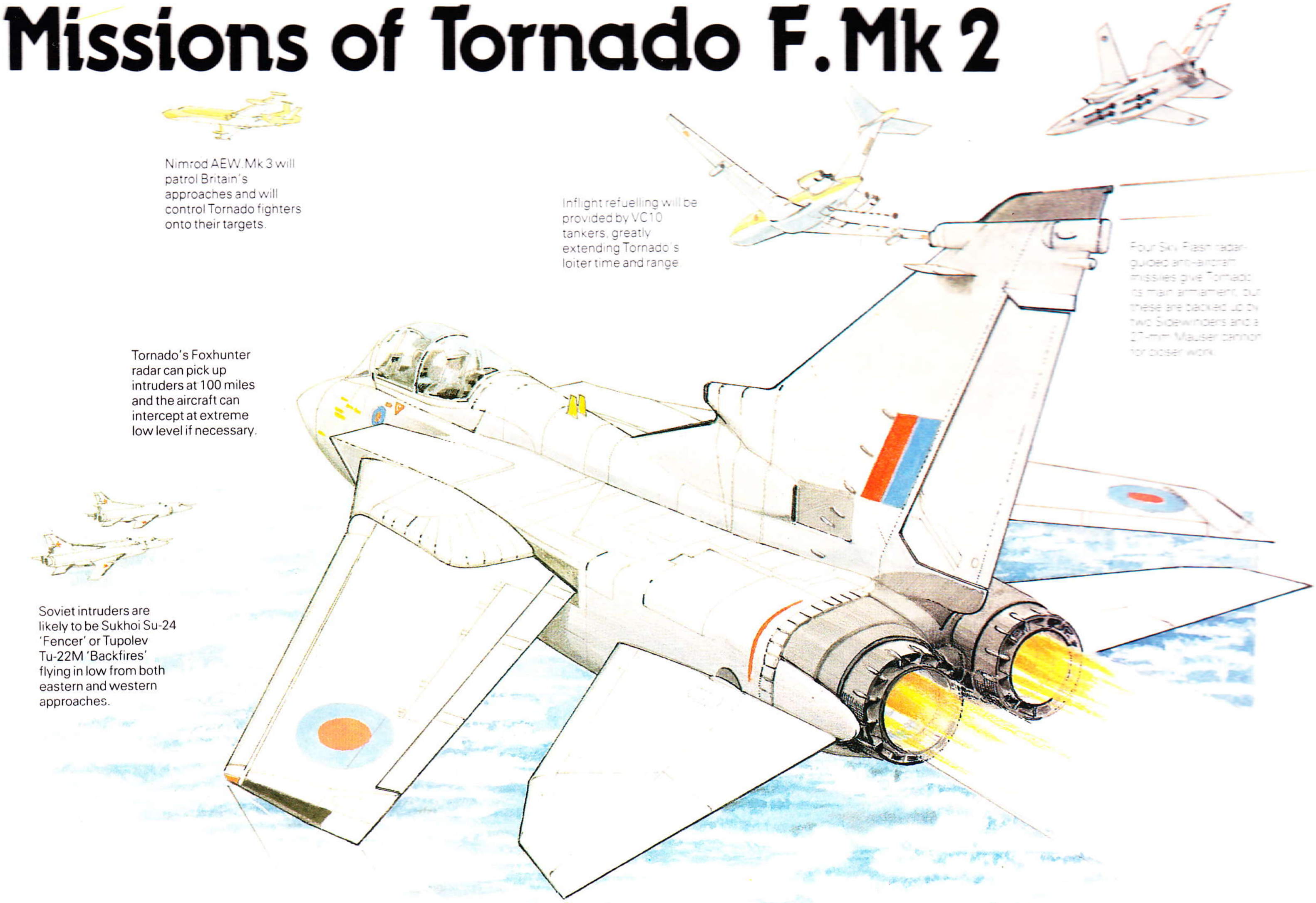
The JA37 Viggen in its new air superiority grey scheme, carrying a full complement of BAe Sky Flash air-to-air missiles, AIM-9L Sidewinders and ventral fuel tank. The JA 37 is the only version of the Viggen still in production, and is by far the most costly model so far.

Specification:
Saab JA37 Viggen
Type: interceptor and multi-role fighter
Armament: one fixed 30-mm Oerlikon cannon with 150 rounds, and provision for stores carried on three underfuselage and four underwing hardpoints; these stores can include up to six RB71 (Sky Flash) medium-range and RB24 (Sidewinder) short-range air-to-air missiles; maximum stores weight is 7000 kg (15,432 lb)
Powerplant: one 12,750-kg (28,108-lb) afterburning thrust Volvo Flygmotor RM8B turbofan
Performance: maximum speed more than 2125 km/h (1,320 mph) or Mach 2 at high altitude; hi-lo-hi combat radius with external stores more than 1000 km (621 miles)
Weight: normal take-off 17000 kg (37,478 lb) with stores.
Dimensions: span 10.60 m (34 ft 9¼ in); length including probe 16.40 m (53 ft 9¾ in); height 5.90 m (19 ft 4¼ in); wing area (including canard foreplanes) 52.20 m² (561.9 sq ft)



JA37 Viggen of the Swedish air force. This model has a completely new set of avionics and weapons, and will fulfil Sweden's air defence capability until at least the mid-1990s.

Missions of Tornado F.Mk 2



Nimrod AEW.Mk 3 will patrol Britain's approaches and will control Tornado fighters onto their targets.

Inflight refuelling will be provided by VC10 tankers, greatly extending Tornado's loiter time and range

Four Sky Flash radar-guided anti-aircraft missiles give Tornado its main armament, but these are backed up by two Sidewinders and a 27-mm Mauser cannon for closer work.

Tornado's Foxhunter radar can pick up intruders at 100 miles and the aircraft can intercept at extreme low level if necessary.

Soviet intruders are likely to be Sukhoi Su-24 'Fencer' or Tupolev Tu-22M 'Backfires' flying in low from both eastern and western approaches.

The Hurricane and Spitfire did not alone win the Battle of Britain. It is more accurate to say that the deliverance of the British Isles from the Luftwaffe in 1940 was brought about by a finely integrated team comprising the Hurricane, Spitfire, radar and associated plotting and direction centres. Though aircraft performance and capabilities have advanced manyfold in the subsequent four decades, the basic principle still holds true: the world's best fighter is no more use against an enemy air attack than a Sopwith Camel if it is in the wrong place or airborne at the wrong time.

In the event of a European war, the UK will resume its former role as the 'unsinkable aircraft-carrier' of the free world, holding some 40 per cent of NATO air strength and thus presenting a prime target for Soviet attack. Gone, however, are the days when vast fleets of Heinkels and Junkers would join formation high over France before setting course for Kent. A future attack could involve small groups or perhaps single aircraft streaking in at low level: Tupolev Tu-22M 'Backfire' bombers operating from Arctic bases and entering British airspace through the 'back door' after a flight over the Atlantic Ocean, and Sukhoi Su-24 'Fencer' interdictors operating with their terrain-following radar to make use of ground features to conceal their deadly approach. In the last Battle of Britain, south-east England was the principal area of operations; now the area is potentially almost everywhere and anywhere in the islands.

Radical solutions are demanded for such apparently insuperable problems, and therefore the RAF is about to implement a fundamental change in its defensive strategy. In future, enemy aircraft will be confronted by fighters as far away as possible from the British Isles, preferably before they have had opportunity to fan out for their attacks. New aircraft and new systems are required for such an undertaking, and these are now becoming available in the forms of the Panavia Tornado F.Mk 2 and BAe Nimrod AEW.Mk 3.

Choke-points for incoming air attacks will be the Iceland-Faroes gap and the North Sea, and these are to be patrolled by the 11 Nimrod AEW.Mk 3s scheduled to be stationed at Waddington; each of these aircraft can spend some seven hours on watch up to 1600 km (1,000 miles) from base. Sensitive aerials mounted in bulbous fairings at the Nimrod's nose and tail will scan the seas for intruders bent on eluding ground-based systems by flying at low level. Acting in parallel to the airborne aircraft of the NATO force of 18 Boeing E-3A Sentry AWACS aircraft, and exchanging data with that fleet, the Nimrod's six-man tactical team will constantly update the picture at No. 11 Group headquarters (the nerve centre of British air defence), taking control of fighters if required in order to vector them towards a distant enemy.

The Nimrod AEW.Mk 3 is to be the anvil of UK air security; the hammer is the Tornado F.Mk 2. Armed with four Sky Flash radar-guided AAMs (a British development of the Sparrow), two Sidewinder infra-red missiles and a 27-mm Mauser cannon, the potent Tornado F.Mk 2 has been developed specifically to the requirements of the RAF. Operating from advanced bases in the north west such as Macrihanish and Stornoway, and refuelled by aerial tankers, the aircraft and its two-man crew will be capable of long patrols far from land, identifying targets over 160 km (100 miles) distant with the advanced Foxhunter radar. Once located, the enemy will have little chance of escape, for thanks to its superb aerodynamics the Tornado F.Mk 2 can fly at low level at speeds which would provoke structural failure in any other aircraft.

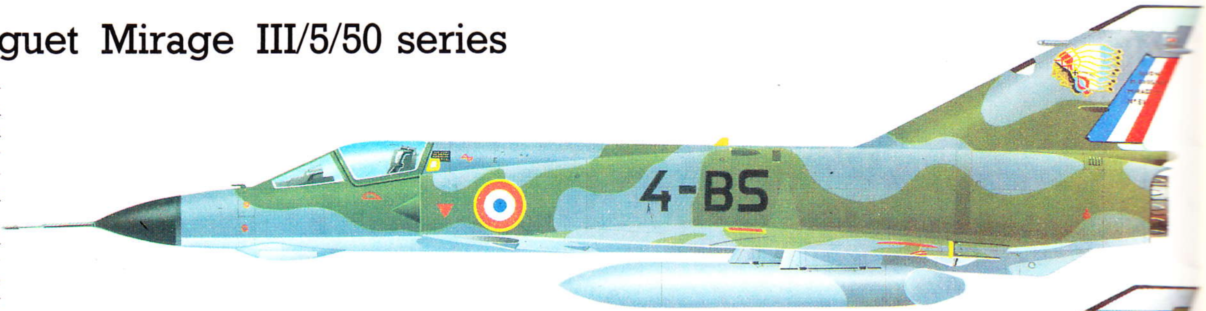
Though the Tornado F.Mk 2 and Nimrod AEW.Mk 3 are capable of independent action, it is in combination that they will achieve maximum effectiveness, each complementing the remarkable capabilities of the other. By the end of the decade, this unparalleled team will have ensured that the UK's 'back door' is securely bolted.

Due to enter squadron service with the RAF in late 1984, the Tornado F.Mk 2 will, teamed with Nimrod AEW.Mk 3s, VC10s and TriStar tankers, offer an enormous improvement in Britain's air defence capability.

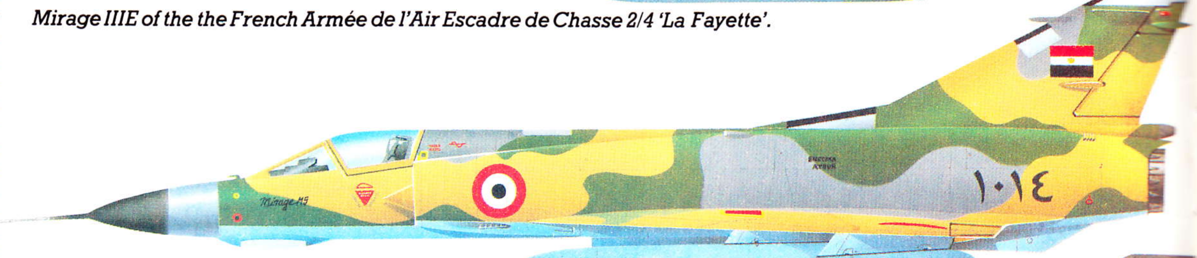
FRANCE

Dassault-Breguet Mirage III/5/50 series

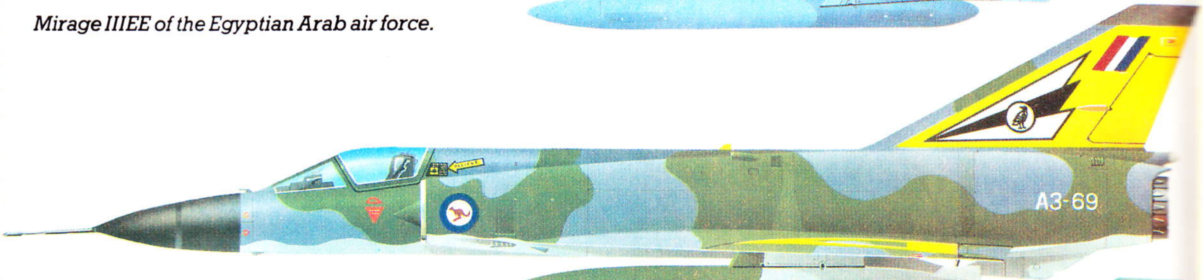
One of the most famous fighters in history, the basic **Dassault Mirage** delta stemmed from Dassault's disbelief in the French official light-fighter concept, and his decision at company expense to build a larger tailless delta Mirage powered by an Atar engine. The Mirage III-001 prototype flew on 17 November 1956 and the first production **Mirage IIIC** fighter for l'Armée de l'Air flew in 1960, to be followed by more than 1,400 basically similar machines for 21 countries. Early models could have a booster rocket engine under the rear in place of gun ammunition and a fuel tank. The large main wheels were sized for rough-field operation, though this is nullified by the very high take-off and landing speeds giving field lengths over 1800 m (6,000 ft) on attack missions. The **Mirage IIIB** and **Mirage IIID** are tandem dual versions, the **Mirage IIIE** series are fighter-bombers with extra weapon-delivery systems (French Mirage IIIEs carry the AN52 nuclear bomb) and **Mirage IIIR** reconnaissance aircraft have a distinctive camera nose replacing the Cyrano II radar. The **Mirage IIIO** is the Australian version of the Mirage IIIE. South African **Mirage III CZ, DZ** and **RZ** Mirages have the 7200-kg (15,873-lb) thrust Atar 9K50 engine which is standard in the **Mirage 50** first flown in 1979 and with upgraded avionics (so far bought by Chile). In contrast the popular **Mirage 5** is a clear-weather day attack aircraft with extra fuel and weapons replacing the radar and other avionics (various radar and laser/HUD options are available). Mirage 5 variants are the **Mirage 5A** single-seater, **Mirage 5D** tandem two-seat trainer and **Mirage 5R** reconnaissance aircraft. The latest addition to the series is the advanced **Mirage IIING**, which has canard foreplanes, 'fly-by-wire' controls, Atar 9K engine and sophisticated avionics.



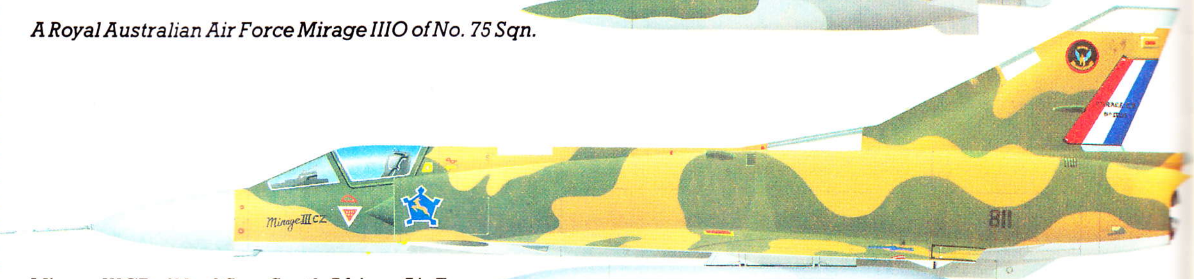
Mirage IIIE of the the French Armée de l'Air Escadre de Chasse 2/4 'La Fayette'.



Mirage IIIEE of the Egyptian Arab air force.



A Royal Australian Air Force Mirage IIIO of No. 75 Sqn.



Mirage IIICZ of No. 2 Sqn, South African Air Force.

Specification:
Mirage IIIE
Type: fighter-bomber
Armament: two 30-mm cannon each with 125 rounds (no rocket); three external pylons for 454-kg (1,000-lb) bombs or equivalent stores including pods, tanks, AS.30 missiles or, for air-to-air role, an R.530 or Super 530 AAM plus two Sidewinder or Magic AAMs.
Powerplant: one 6200-kg (13,670-lb) afterburning thrust SNECMA Atar 9C turbojet

Performance: maximum speed, clean at 12000 m (39,370 ft) 2350 km/h (1,460 mph) Mach 2.2, or clean at sea level 1390 km/h (863 mph); service ceiling 17000 m (55,775 ft); radius on a hi-lo-hi attack mission with one or two tanks 1200 km (745 miles)
Weights: empty 7050 kg (15,540 lb); maximum take-off 13700 kg (30,200 lb)

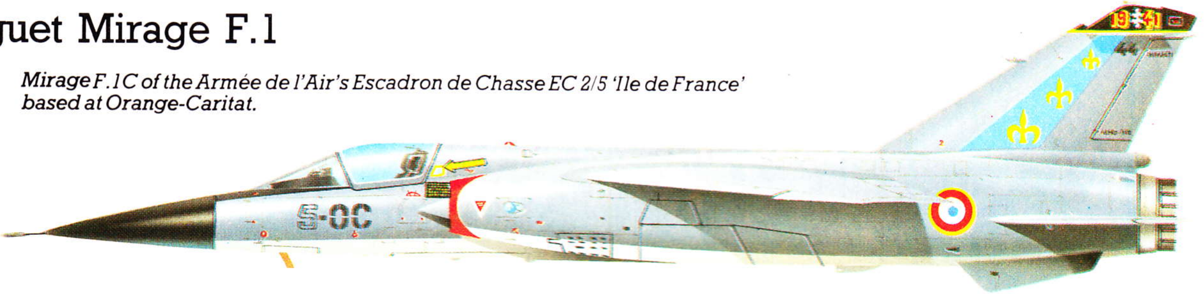
Dimensions: span 8.22 m (26 ft 11½ in); length 15.03 m (49 ft 3½ in); height 4.5 m (14 ft 9 in); wing area 34.85 m² (374.6 sq ft)

Two-seat Mirage trainers of the Escadre de Chasse de Transformation 2/2 'Côte d'Or' based at Dijon.

A Mirage of the Argentine air force prior to the Falklands war of 1982. Most were held back for air defence of the Argentine mainland.

FRANCE

Dassault-Breguet Mirage F.1

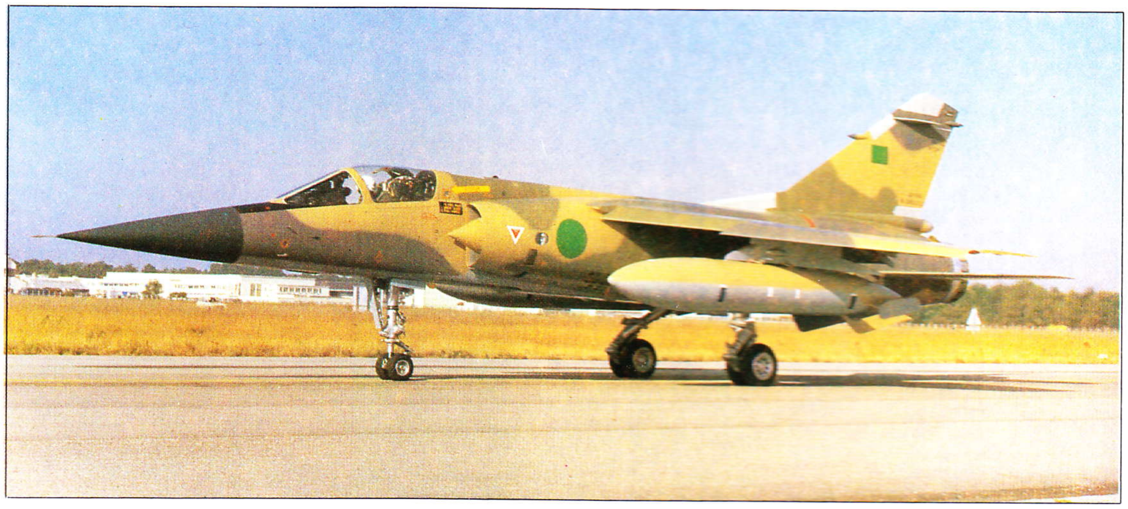


Mirage F.1C of the Armée de l'Air's Escadron de Chasse EC 2/5 'Ile de France' based at Orange-Caritat.

Not believing in the enduring appeal of the Mirage III, Dassault sought a successor from 1961 and settled on a much larger type powered by the big TF306 augmented turbofan and flown with a delta wing, a high wing and tail (Mirage F.2) and even VTOL lift jets. The Mirage F.2 was a good aircraft but Dassault eventually, in 1965, persuaded l'Armée de l'Air to buy a similar aircraft scaled back to Atar size, and this, the **Dassault Mirage F.1**, first flew in 1966. Though the wing is much smaller than the delta, it is so much more efficient (with double-slotted trailing-edge flaps and a drooping leading edge) that, combined with 40 per cent more internal fuel in a smaller airframe, the Mirage F.1 has a much shorter field length, three times the supersonic endurance, twice the tactical radius at low level and all-round better manoeuvrability. The avionics core of the series is the Thomson-CSF Cyrano IV fire-control radar, which in the Mirage F.1E version has modifications for air-to-surface ranging and to permit low-altitude penetration of enemy air space under any weather conditions. More advanced radar is being developed. The **Mirage F.1C** all-weather interceptor reached l'Armée de l'Air squadrons in 1973, and by 1983 total Mirage F.1 orders reached over 700, almost 500 of them for export. Variants include the **Mirage F.1A** simplified attack aircraft, **Mirage F.1B** dual trainer, **Mirage F.1E** comprehensive all-weather attack aircraft and **Mirage F.1R** multi-sensor reconnaissance platform. The **Mirage F.1C-200** is a French variant with an inflight-refuelling probe for overseas deployment. Quick scramble is enhanced by a ground truck which cools the missile seekers, radar and cockpit, heats navigation and weapon-aiming systems and shields the cockpit with a sunshade! Production is shared not only with other French companies, as with other Mirages, but with SABCA/Sonaca of Belgium, which builds the rear fuselage. Armaments Development and Production Corporation of South Africa holds a manufacturing licence, and its models are indicated by a Z suffix to the basic designation. French Mirage F.1C interceptors have by 1983 been updated to carry the R.530F radar-homing air-to-air missile.

Specification:
Mirage F.1C
Type: fighter-bomber
Armament: two 30-mm DEFA cannon each with 125 rounds; AAM (Sidewinder/Magic rails at wingtips, plus five Alkan universal pylons for 4000 kg (8,818 lb) of external stores including tanks, bombs, pods, launchers or R.530 or Super 530 AAMs, AS.30 or reconnaissance pod with cameras, EMI SLAR and Cyclope IR system
Powerplant: one 7200-kg (15,873-lb) afterburning thrust SNECMA Atar 9K-50 turbojet
Performance: maximum speed, clean at high altitude 2350 km/h (1,460 mph) or Mach 2.2, or clean at sea level 1450 km/h (900 mph) or Mach 1.2; service ceiling 20000 m (65,600 ft) radius on a lo-lo mission with 1600 kg (3,527 lb) of weapons 644 km (400 miles)
Weights: empty 7400 kg (16,314 lb); maximum take-off 15200 kg (33,510 lb)
Dimensions: span 8.40 m (27 ft 6¾ in); length 15.0 m (49 ft 2½ in); height 4.50 m (14 ft 9 in); wing area 25.0 m^2 (269.1 sq ft)

Libya is just one of the dozen nations that fly the commercially very successful and capable Mirage F.1.



FRANCE

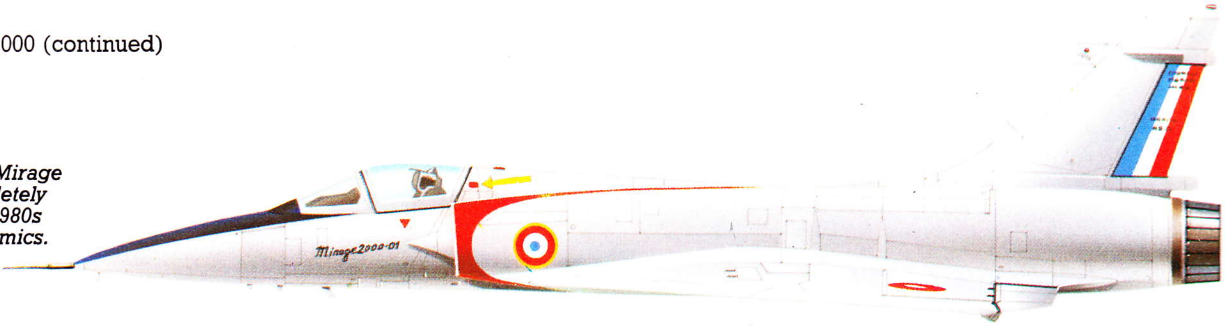
Dassault-Breguet Mirage 2000

After the Mirage F.1 was ordered, Dassault spent much effort on the large variable-sweep Mirage G series. This led to the ACF (Avion de Combat Futur) with a wing fixed at 55°, but in December 1975 this too was cancelled. In its place came another of the small single-Atar machines, and it marked a return to the tailless delta configuration. It was, however, a totally different aircraft, designed to CCV (control-configured vehicle) technology with variable camber wings having hinged leading and trailing edges, electrically signalled controls and artificial stability. Structure was entirely new, as was the engine whose extremely low bypass ratio was designed for Mach 2 at high altitudes, calling for small frontal area, rather than for subsonic fuel economy. Choice of a single-shaft engine also greatly increased weight; the basic engine weighing 1450 kg (3,195 lb).

The prototype **Dassault-Breguet Mirage 2000** flew on 10 March 1978 and following successful development, the first production fighter flew in December 1982, with 1983 production including tandem-seat **Mirage 2000B** trainers. A total of 127 was expected then to be on order (48 by 1982), all in basic air-defence configuration. Initial production examples of the Mirage 2000 have the RDM multi-mode radar, while machines from no. 51 will have the considerably more capable RDI air interception equipment for delivery from 1986. The pulse-Doppler RDI radar is designed to pick up a target of 5m^2 (54 sq ft) at a range of 100 km (62 miles). RDM radar is standard for all export sales of the Mirage 2000. Despite the extremely high price, said by Egypt to be US$50 million per aircraft, the same type is also on order for Egypt (20) and India (40), and plans were laid for the type to be built under licence in both countries if negotiations were successful. India has now cancelled its plan to build. Peru has

The very pretty but very expensive Mirage 2000 has chalked up an impressive export sales total even prior to the type entering service with the French air force. Egypt, India and Peru were among the early buyers.

Though similar to the earlier Mirage III, the Mirage 2000 is a completely new aircraft, equipped with 1980s style, structure and aerodynamics.



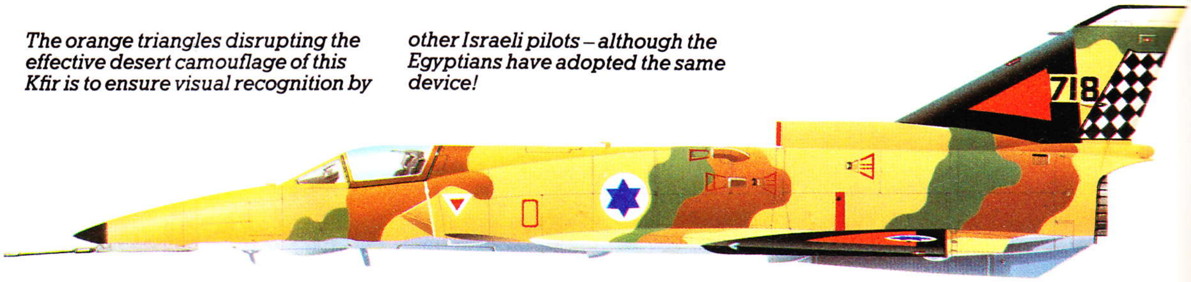
also ordered 26. Later the **Mirage 2000N** is to be developed with airframe strengthened to fly at 1110 km/h (690 mph) at sea level (this is very slow by modern standards) and equipped with terrain-following radar and other modern attack systems for the delivery of the ASMP nuclear stand-off missile.

Specification:
Mirage 2000
Type: fighter
Armament: two 30-mm cannon each with 125 rounds; normal missile load two Super 530 AAMs inboard under wings and two Magic AAMs outboard (Mirage 2000N attack version is planned to carry heavy and varied weapon loads)
Powerplant: one 9000-kg (19,840-lb) afterburning thrust SNECMA M53-5 bypass turbojet
Performance: maximum speed, clean at high altitude 2350 km/h (1,460 mph) or Mach 2.2; service ceiling 20000 m (65,600 ft) range at high altitude with two tanks 1480 km (1,118 miles)
Weights: empty 7400 kg (16,315 lb); maximum take-off 16500 kg (36,375 lb)
Dimensions: span 9.0 m (29 ft 6 in); length 14.35 m (47 ft 1 in); height 5.30 m (17 ft 6 in); wing area 41.0 m^2 (441.3 sq ft)

ISRAEL

IAI Kfir

The orange triangles disrupting the effective desert camouflage of this Kfir is to ensure visual recognition by other Israeli pilots – although the Egyptians have adopted the same device!



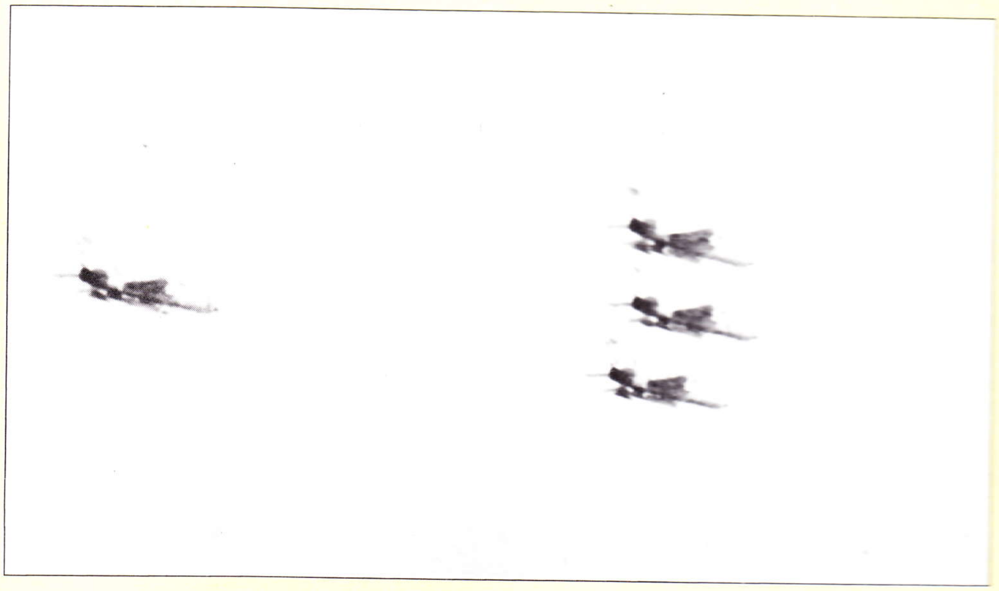
When the French cut off military supplies to Israel in June 1967, the decision was taken for Israel to become self-sufficient in Mirage-type aircraft. A near-copy with the Atar engine was built as the **IAI Nesher** (available Neshers were bought secondhand by Argentina and named **Dagger**, being very active in the Falklands campaign). Israel Aircraft Industries then tackled the much greater task of building a development with the more powerful and also shorter J79 engine. A J79, similar to those in Israeli Phantoms, was flown in a two-seat Mirage IIIB in September 1971. A prototype **IAI Kfir** (Lion Cub) was flown in 1973 and publicly revealed in April 1975. In July 1976 the definitive **Kfir-C2** was shown, with fixed canard foreplanes on the inlets, small strakes along the redesigned nose and a new dogtooth leading edge to the wing. The object of the exercise (achieved most successfully) was improvement in field performance coupled with a great increase in combat capability (especially at the lower end of the speed range to which dogfights almost invariably descend) by bettering the sustained turn rate; collateral benefits are reduced gust response at low altitude and better handling at high angles of attack. The different engine installation had previously required total redesign of the rear fuselage and a cooling inlet in the dorsal fin. The new forward fuselage is extended to house various avionic items including the Elta 2001B target-acquisition and tracking air-to-air and air-to-ground pulse-Doppler radar, and extremely comprehensive navigation/communication identification, navigation and weapon-delivery systems are installed, as well as a Martin-Baker Mk 10 seat. In early 1981 IAI revealed the tandem-seat **Kfir-TC2** with longer and down-sloping nose; this is a weapon-system trainer and EW (electronic warfare) platform. About 250 were estimated to have been delivered by late 1982, Ecuador being the first export customer. In 1982 Kfirs saw extensive action over the Lebanon, and in 1983 IAI announced the **Kfir-C7** with improved weapons capability and provision for inflight-refuelling.

Specification:
Kfir-C2
Type: multi-role fighter and attack aircraft
Armament: two 30-mm IAI-built DEFA 552 cannon each with 140 rounds; up to 4295 kg (9,468 lb) of stores on seven hardpoints including bombs, rockets, Maverick/Hobos/Durandal ASMs, Shrike anti-radar missiles, Shafrir 2 AAMs (or Sidewinders), ECM pods and tanks
Powerplant: one 8119-kg (17,900-lb) thrust General Electric J79-J1E afterburning turbojet
Performance: maximum speed, clean at high altitude 2440 km/h (1,516 mph); climb to 15250 m (50,000 ft) in 5-17 minutes; service ceiling 17680 m (58,000 ft); radius on hi-lo-hi mission with seven 227-kg (500-lb) bombs, two AAMs and two tanks 768 km (477 miles)
Weights: empty 7285 kg (16,060 lb); maximum take-off 14700 kg (32,408 lb)
Dimensions: span 8.22 m (26 ft 11½ in); length 15.65 m (51 ft 4¼ in); height 4.55 m (14 ft 11¼ in); wing area 34.8m^2 (374.6 sq ft)

A capable all-rounder, the Kfir is seen here in low-visibility fighter markings, though it is being bombed up for an attack mission.

Air War over Lebanon

In 1982 Israel was once again involved in an air war in the skies of the Middle East. Though her actions on the ground won her few admirers, her pilots and their new aircraft scored devastating and spectacular victories over the opposing Syrians.



A flight of Syrian MiG-21s fly towards Beirut on 11 June 1982 to battle with the Israeli air force. Few survived to fight another day.

At 15.15 on 4 June 1982 the uneasy peace maintained between warring Palestinian and Christian forces by occupying Syrian troops was shattered as Israeli McDonnell Douglas Phantoms and McDonnell Douglas Skyhawks roared over Beirut, capital of Lebanon. Seemingly untroubled by the barrage of ground-fire and SA-7 shoulder-launched SAMs streaking up to meet them, the fighter-bombers pressed home their attacks on Palestinian refugee camps around the city, a massive explosion confirming a direct hit on an ammunition dump. After 90 minutes the jets withdrew, leaving scenes of destruction and chaos in their wake. It was the day after the Israeli ambassador in the UK had been gunned down in a terrorist attack. Israel was clearly intent on massive revenge.

But there was more to follow. Raids were repeated on 5 June, and on the next day Israel's troops advanced into Lebanon, bent on eliminating the Palestinian guerrilla forces which had been a thorn in Israel's side for so many years. The opportunity was also taken to attack the Syrian SAM sites recently installed in the Bekaa valley south-east of Beirut, and the Syrian air force responded. Large-scale air battles followed, but Israel pressed on to her goal and the Palestine Liberation Organization was banished from Lebanon.

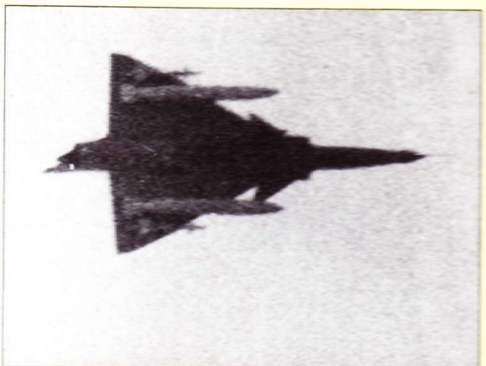
Flying top cover for the fighter-bombers were two of the latest additions to the Israel Defence Force/Air Force: the McDonnell Douglas F-15 Eagle and General Dynamics F-16 Fighting Falcon, the latter making its debut in air-to-air warfare. Optimized for combat agility (dogfighting) the F-16 shared in the amazing success of the IDF/AF over its Syrian counterpart, accounting for 44 of the 85 air-to-air claims made by Israel, the majority of them in three days of intense fighting on 9-11 June. The need for positive identification in the mêlée brought fighters into close contact before weapons were fired, and under such circumstances the F-16 is in its element. Using mainly Sidewinder AAMs and the Israeli-produced Shafrir, the aircraft wrought havoc amongst the Soviet-supplied Mikoyan-Gurevich MiG-21 'Fishbed' and MiG-23 'Flogger' fighters of the Syrian air arm, losing not one of the 72 then in service with three squadrons.

Astounding victories

Even after allowance for over-claims made in good faith, the scale of the F-16's victory is little short of astounding, particularly as the admittedly ageing MiG-21 is still a highly manoeuvrable aircraft and the MiG-23 occupies a significant position in the Soviet air forces. General Dynamics might modestly argue that this is as it should be, for considerable effort has been devoted to giving the aircraft unparalleled agility and equal capability in the fighter-bomber role. Having begun life as a demonstrator of new fighter technology in the early 1970s, the aircraft was adopted for the USAF for both interception and ground-attack duties, the additional equipment required for such operations being no handicap to its excellent dogfighting performance.

Had not a smaller number of more sophisticated F-15s equalled their companions' success, and were it not for the fact that BAe Sea Harriers were simultaneously attracting attention in the UK's war with Argentina, the F-16's achievement would perhaps be more widely acclaimed. Though some may point to disparities in training or motivation between the Israeli and Syrian pilots locked in air combat over Lebanon, the conclusion cannot be escaped that the MiG-21 and MiG-23 have been outclassed, at least in fair-weather fighting. This should be of considerable comfort to NATO, whose members rely heavily on the F-16 as an air defence aircraft.

Israeli F-15 Eagles formate over the desert. The F-15 equalled the success of the F-16, though fewer were deployed. Israel's Eagles had often dominated the skies over Lebanon during the skirmishes prior to the June 1982 episode.

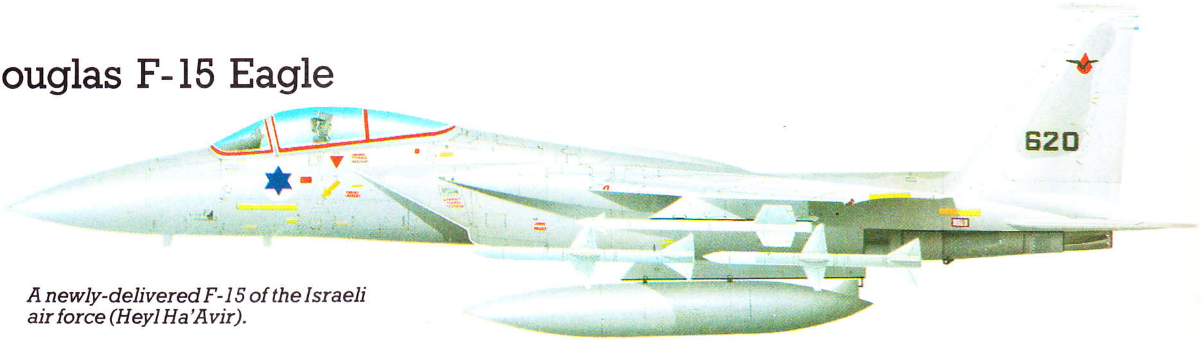


Dawn, 12 August 1982. An Israeli Kfir swoops through the skies of West Beirut. Protected with Sidewinders, the agile Kfirs were used in a wide variety of missions.

USA

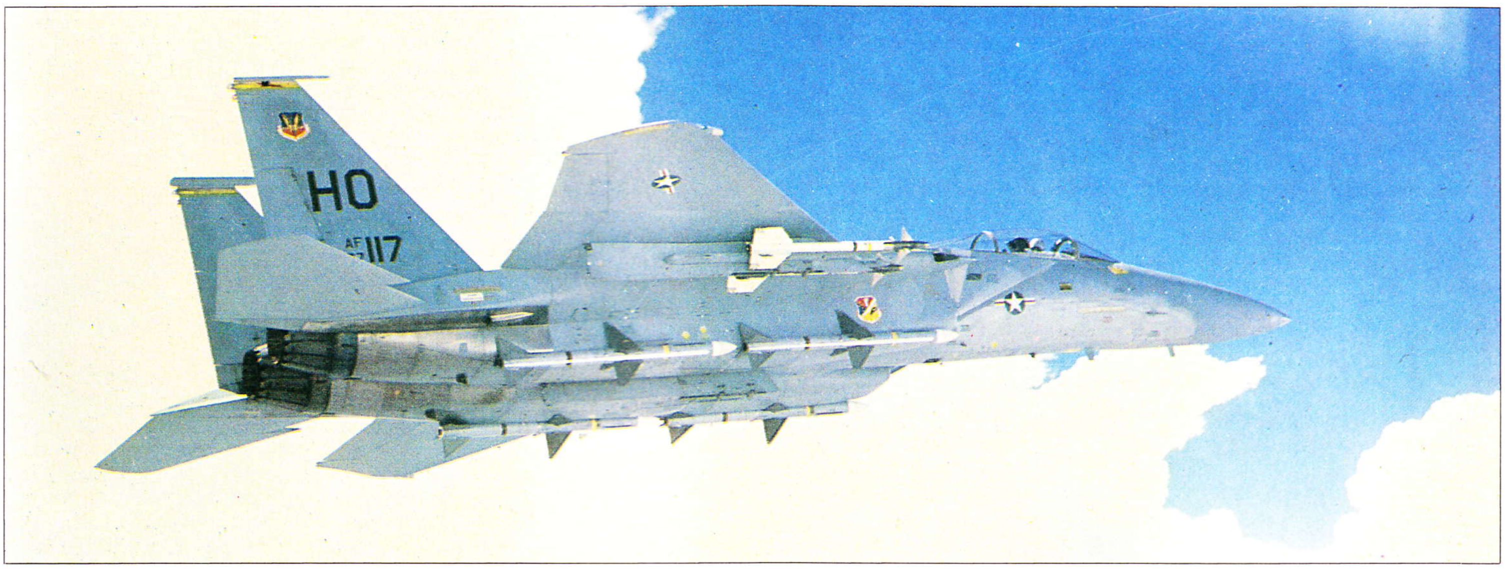
McDonnell Douglas F-15 Eagle

Like its predecessor in the St Louis factory (the F-4), the **McDonnell Douglas F-15 Eagle** is widely regarded as the best fighter in the world, though it has the disadvantages of great size and high operating cost. It was developed to rival the MiG-25, but unlike the Soviet aircraft it is not a stand-off interceptor but a close-combat dogfighter with a vast wing area and two extremely powerful engines. The four Sparrow AAMs are carried against the square corner edge along the bottom of the large inlet ducts, and the gun is mounted in the right inboard wing, drawing ammunition from a large 940-round drum in the fuselage. Hughes provide the AN/APG-63 pulse-Doppler radar, with computerized data-processing to leave nothing on the pilot's head-up or head-down displays except the vital items of real interest. All-round view is superb, and the F-15 pioneered the HOTAS (hands on throttle and stick) concept to ease the pilot's task in combat. Very heavy attack weapon loads can be carried, and the original **F-15A** and tandem-seat **F-15B** have been followed by the **F-15C** and two-seat **F-15D** in which internal fuel is increased, FAST (fuel and sensor, tactical) pallets fitting against the sides of the fuselage give 4422 kg (9,750 lb) of extra fuel with no extra drag, and avionics are updated. The **F-15E Enhanced Eagle** can carry a 10885-kg (24,000-lb) bombload, but had not been ordered in late 1983. By that time over 700 Eagles had been delivered to the USAF, Israel, Saudi Arabia and Japan, in which country the variants are the **F-15J** single- and **F-15DJ** two-seater. The US Air Force plans to evaluate the Enhanced Eagle against the F-16XL, and the winner may be ordered to the extent of 400 examples as the USAF's standard all-weather strike fighter, a role to which the AN/APG-63's modified form, with SAR (synthetic aperture radar) configuration, is ideally suited: small targets can be seen in any weather conditions (and at night) at a range of 32 km (20 miles). The F-15E will also have the 'Pave Tack' targeting pod, whose FLIR (forward-looking infra-red) sensor will be integrated with the radar.



A newly-delivered F-15 of the Israeli air force (Heyl Ha'Avir).

Specification:
F-15C Eagle
Type: fighter with secondary attack role
Armament: one 20-mm M61A-1 cannon; four Sparrow (latter AMRAAM) AAMs plus four Sidewinder (later ASRAAM) AAMs; option of 7258 kg (16,000 lb) attack weapon load on five pylons
Powerplant: two 10855-kg (23,930-lb) thrust Pratt & Whitney F100-100 augmented turbofans
Performance: maximum speed, clean except AAMs at high altitude 2660 km/h (1,650 mph) or Mach 2.5; absolute ceiling 30500 m (100,000 ft); ferry range with maximum fuel 5560 km (3,450 miles)
Weights: empty 14334 kg (31,600 lb); loaded, clean 20185 kg (44,500 lb); maximum take-off 30845 kg (68,000 lb)
Dimensions: span 13.05 m (42 ft 9¾ in); length 19.43 m (63 ft 9 in); height 5.63 m (18 ft 5½ in); wing area 56.5 m² (608.0 sq ft)



An F-15 of the 49th Tactical Fighter Wing displays its potent weapon load: four Sidewinders, four Sparrows and the 20-mm cannon housed in the wing root.

USA

General Dynamics F-16 Fighting Falcon

Initiated as an LWF (Light Weight Fighter) demonstrator in 1972, to see whether or not a fighter smaller and less costly than the F-15 could have any value, the YF-16 flew in February 1974, won over a Northrop rival and was then developed into the larger and immensely more capable **General Dynamics F-16A Fighting Falcon**, which was not only ordered in large numbers (650, later increased to 1,388 against a planned total of 2,333) by the USAF but also by Belgium, Denmark, the Netherlands and Norway to replace the F-104. Other buyers are Israel, South Korea, Egypt, Pakistan and Venezuela. In structure, aerodynamics, avionics and systems the F-16 is outstandingly well engineered, combining CCV (control-configured vehicle) technology and fly-by-wire signalling with an unprecedented thrust/weight ratio using a single F-15 type engine fed by a fixed ventral inlet upstream of the nose gear. The overall effect is a magnificent air-combat platform with adequate performance but phenomenally good agility, roll, climb and acceleration. Important contributory factors are the unswept wing with automatically variable camber, and the pilot reclining in an Aces II seat under a frameless canopy with his right hand grasping a small stick which senses any applied forces with near-zero movement. All combat controls for the aircraft, weapons, Westinghouse APG-66 radar and Marconi HUD (head-up display) are on the stick or throttle. The APG-66 radar is a highly capable equipment: the look-up range is 74 km (46 miles) while the look-down range, even against ground clutter, is 56 km (35 miles). The set is of the pulse-Doppler type and has range and angle track modes, with information fed to the pilot via a Marconi head-up display and Kaiser radar electro-optical display. Other key avionics are the Delco fire-control computer, ALR-69 radar warning receiver and Sperry air-data computer. The USAF buy includes 204 **F-16B** combat-capable two-seaters with reduced fuel. The equivalent **F-16C** and **F-16D** single- and two-seaters have progressively updated and augmented avionics including AMRAAM missiles, LANTIRN night/all-weather pods and new cockpit displays. F-16s have flown with J79 and F101 engines, the **AFTI/F-16** has advanced direct-force controls, and the **F-16XL** (**F-16E**) prototypes have double the wing area and more fuel to carry greater weapon loads from shorter fields with even better manoeuvrability. The J79-engined **F-16/79** is being offered as a lower-cost export model.

Specification:
F-16A Fighting Falcon
Type: multi-role fighter
Armament: one 20-mm M61 cannon with 515 rounds; nine hardpoints for normal maximum load of 7802 kg (17,200 lb), with theoretical limit of 9276 kg (20,450 lb) including all available tactical stores, 'Pave Penny' laser tracker, ECM—EW pods (usually ALQ-131) and special stores including ARMs in 'Wild Weasel' role
Powerplant: one 10814-kg (23,840-lb) afterburning thrust Pratt & Whitney F100-200 turbofan
Performance: maximum speed, clean except AAMs at 12190 m (40,000 ft) 2173 km/h (1,350 mph) or Mach 2.05; service ceiling more than 15240 m (50,000 ft); radius on a hi-lo-hi mission with six Mk 82 bombs and no tanks 547 km (340 miles)
Weights: empty 6866 kg (15,137 lb); maximum take-off 17010 kg (37,500 lb)
Dimensions: span 9.5 m (31 ft 0 in); length 14.52 m (47 ft 7¾ in); height 5.09 m (16 ft 8½ in); wing area 27.87 m² (300.0 sq ft)

F-16 Fighting Falcon in Action

A high-flying Fighting Falcon lets go a Sidewinder, part of the deadly combination that devastated the Syrian air force in the skies over Lebanon.

The tanned Israeli pilot climbed up the specially designed aluminium ladder and eased down into the F-16's comfortable cockpit. He seemed not so much to be sitting in the aircraft as lying down on top of it, and as he surveyed the advanced electronic displays facing him he could not help noticing the contrast with the mass of dial instruments in his beloved old Phantom. Even when he had donned his bone-dome helmet and moved the switch to close the enormous canopy, the pilot was yet again impressed by the fantastic all-round view. There was absolutely nothing to get in the way, except for two narrow blades on each side of the HUD (head-up display) directly ahead, one of which indicates whether or not NWS (nose-wheel steering) is engaged. Turning to the rear the vast expanse of distortion-free polycarbonate gives a view never before enjoyed by a fighter pilot, because without the wind buffet of an open cockpit there is a perfect view astern as far as the head and eyes can twist. You have only to look to see if you are making a contrail, and there is no place for bad guys to hide except down below.

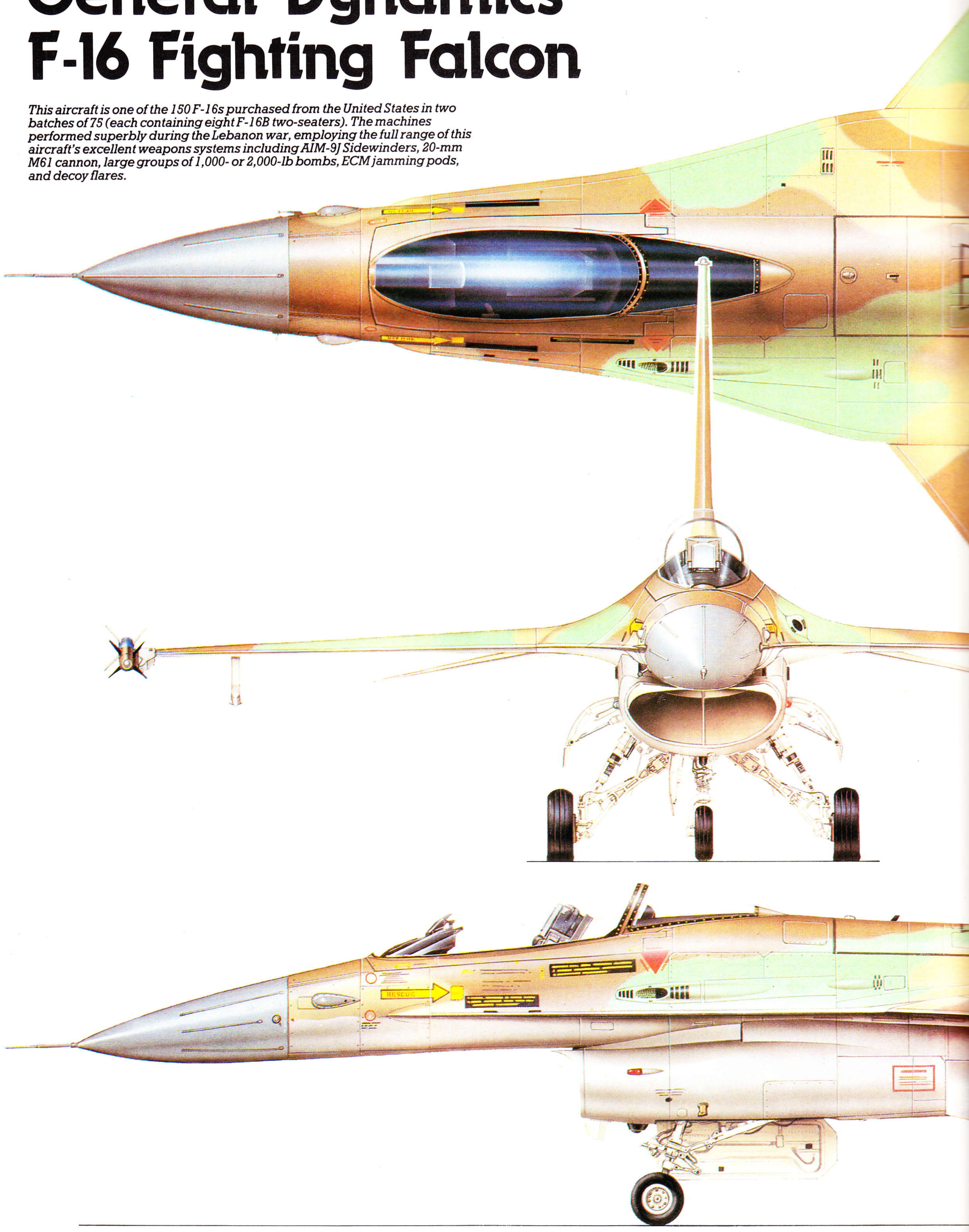
On this occasion, in early July 1982, there was a fair chance there would be some bad guys, because unlike other operators of the F-16 Fighting Falcon the Heyl Ha'Avir (the Israeli air force) has flown it in action. The first time this happened was on 7 June 1981, when eight aircraft were detailed to attack the Osirak nuclear power station in Iraq. This station's reactors had long been considered to be a source of weapons-grade plutonium, and thus potentially a danger of the greatest magnitude to the beleaguered Jewish state. The eight F-16As, all newly delivered in the first Heyl Ha'Avir batch of 75, were only just ready for flying combat missions (though the eight pilots were men of vast experience on the McDonnell Douglas A-4 and McDonnell Douglas F-4 of an earlier generation). Quickly they had learned how to manage the totally new technology of the F-16, so electronically based it is popularly called the 'electric fighter'. On that first-ever attack mission each aircraft carried two 2,000-lb (907-kg) Mk 84 bombs, plus an ECM pod and external fuel. Flying from Etzion AB in the then-occupied Sinai, the route lay across more than 1000 km (620 miles) of featureless desert before reaching the target, with much of the mission flown at low level. Every bomb was placed exactly on target, and all aircraft returned undamaged. Air refuelling was not used.

But in the summer of 1982 the circumstances were different. Missions were short, from bases in Israel across the border to Beirut, the shattered capital of Lebanon, and then the final base of the army of the PLO (Palestine Liberation Organization). A-4s, F-4s and F-16s were used to bomb the PLO areas in west Beirut, but the F-16 was also needed to maintain command of the air in the face of Syrian Mikoyan-Gurevich MiG-21s and MiG-23s. Many combats ensued, all apparently visual at close range, and though no detailed figures have been published there is plenty of evidence that the ascendancy of the US-built fighter was total. Every hostile aircraft was detected at a distance of tens of kilometres, tracked automatically and outmanoeuvred so that it could never get within firing parameters. The F-16s further

Afterburner blazing, an F-16 from the famed 8th Tactical Fighter Wing – the 'Wolf Pack' – thunders down the runway at Kunsan Air Base, South Korea.

General Dynamics F-16 Fighting Falcon

This aircraft is one of the 150 F-16s purchased from the United States in two batches of 75 (each containing eight F-16B two-seaters). The machines performed superbly during the Lebanon war, employing the full range of this aircraft's excellent weapons systems including AIM-9J Sidewinders, 20-mm M61 cannon, large groups of 1,000- or 2,000-lb bombs, ECM jamming pods, and decoy flares.



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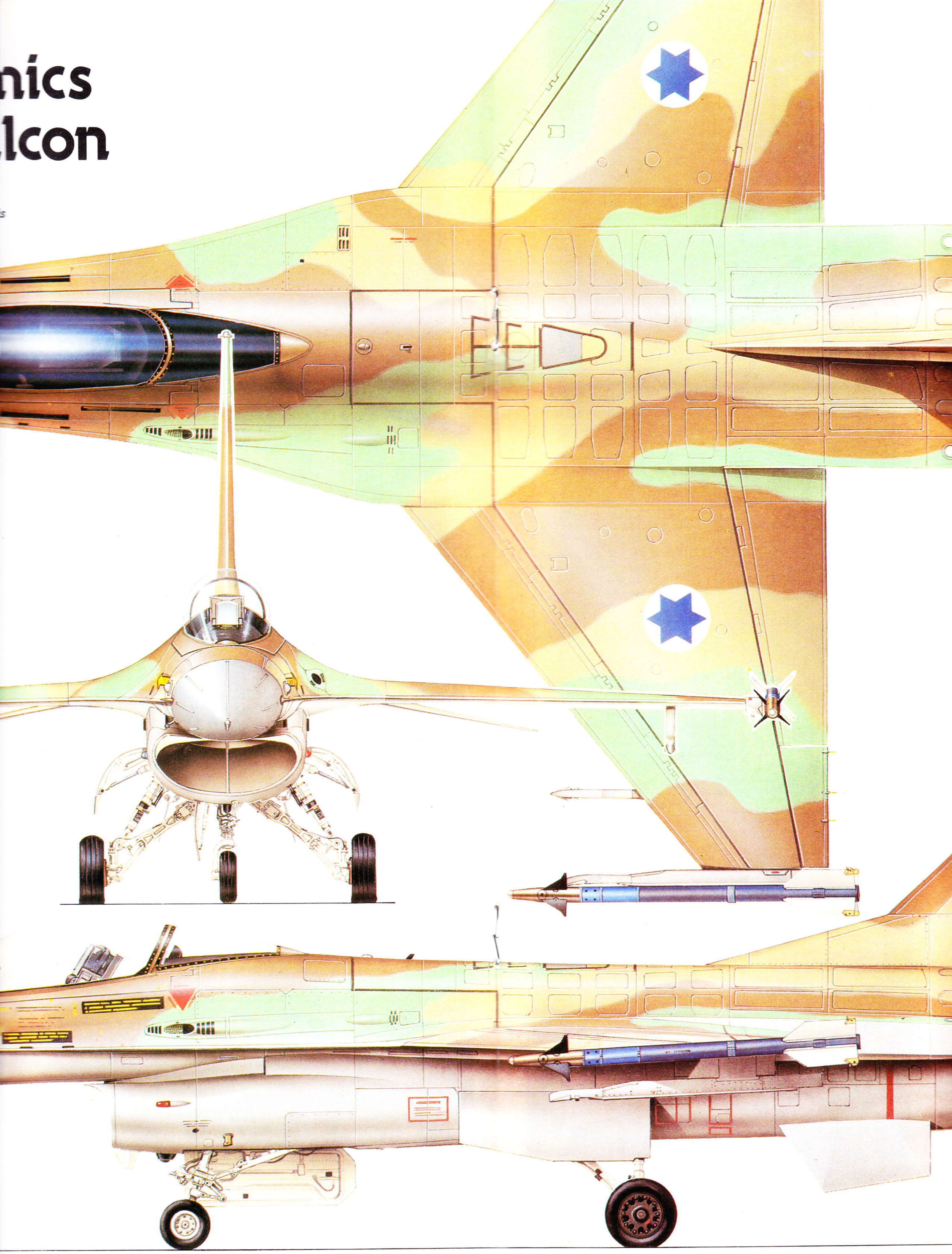
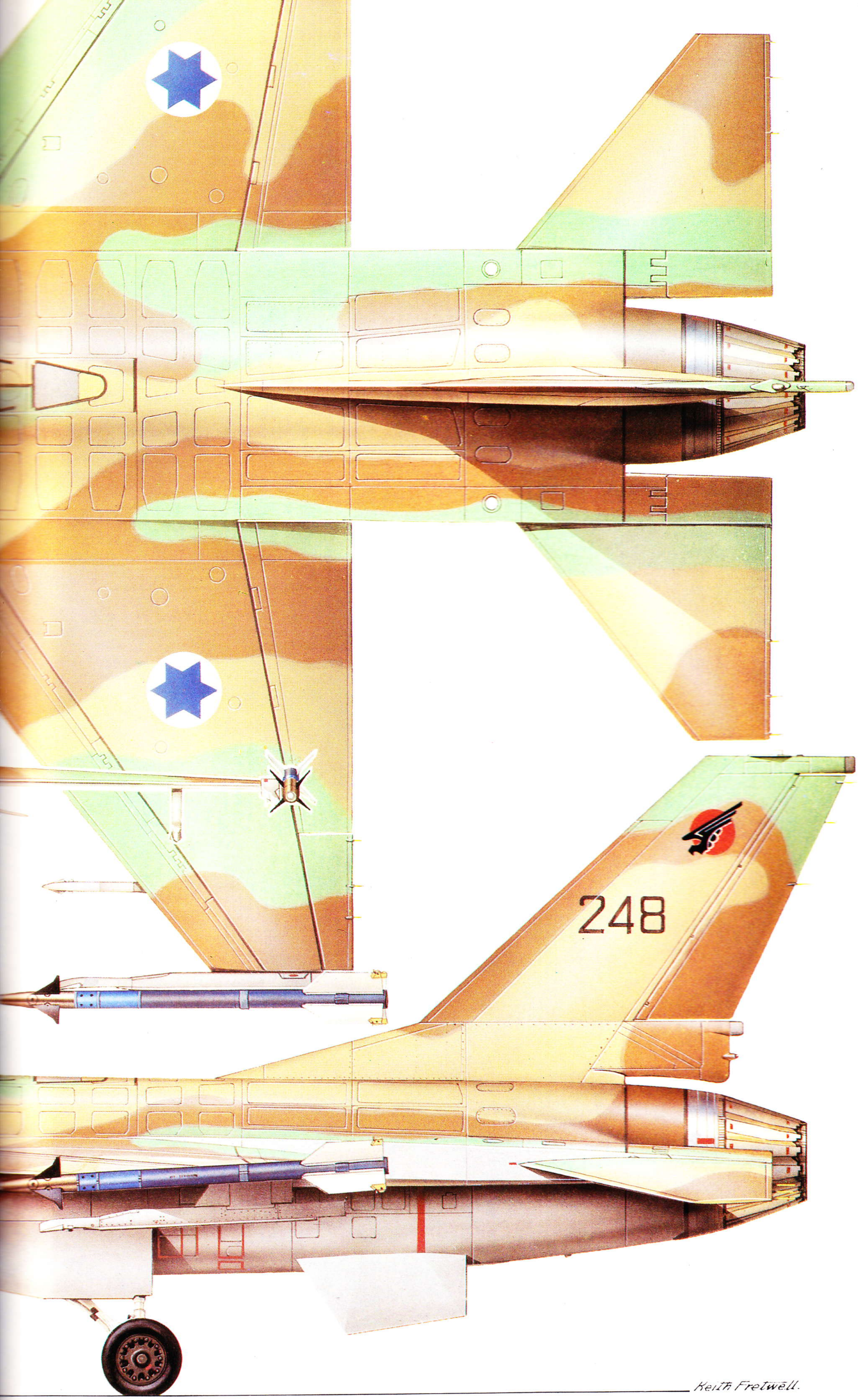




Keith Fretwell.

High visibility in low visibility colours! Pilot vision is unrivalled in the F-16's one-piece bubble canopy.

protected themselves with ECM jammers and dispensed chaff and flare payloads, the latter being (for the first time) seen by the world on TV newsreels. Any hostile aircraft that became imminently dangerous was promptly shot down, using guns and either Shafrir or Sidewinder missiles.

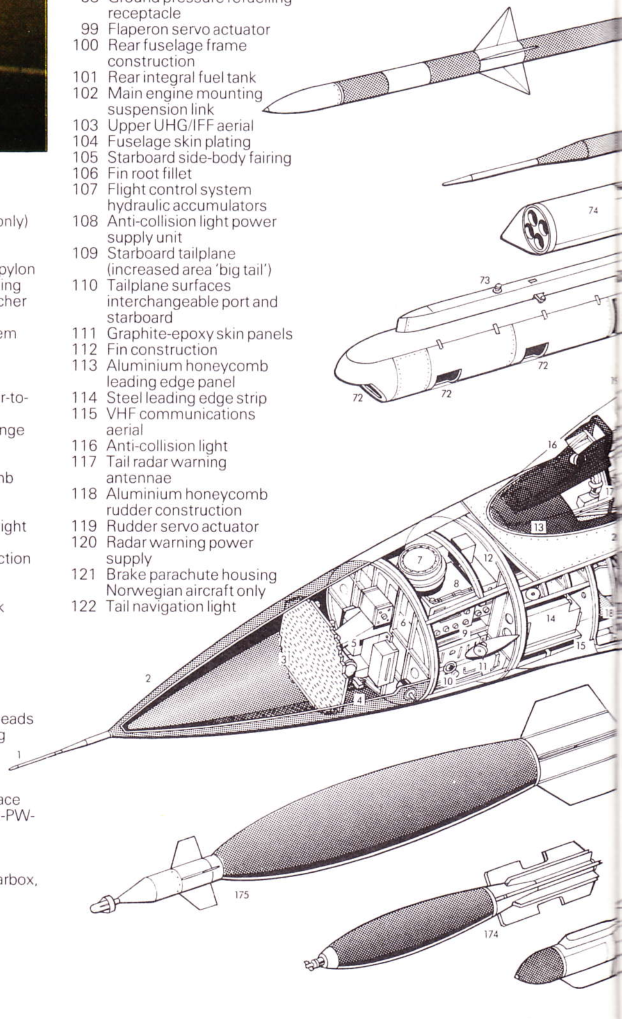
That the General Dynamics fighter was an attractive high-performance machine was obvious from the roll-out of the original Model 401 (YF-16), the two examples of which were smaller and much lighter than the production versions. It was only after the F-16A got into service in January 1979 (with the 388th TFW at Hill AFB) that its true capability became apparent. By 1980 gruelling intensive exercises simulating war conditions showed that this fighter could fly from six to 10 sorties per day, quickly deploy to half way across the globe and then go straight into action, and absolutely dominate its airspace no matter how good the opposing pilots might be. Put up against the famed F-4E Phantom, previously a yardstick against which other multi-role fighter-bombers were judged, the little F-16 not only flew rings round the older type in air combat but also carried the same bombload twice as far, or double the bombload for the same distance.

F-16 a winner

Even then there were doubters and disbelievers convinced they could give the F-16 a run for its money, but there were not many of these left after 24 June 1981. A team from the 388th TFW flew to Scotland to take part in the RAF inter-service tactical bombing competition, and to say the F-16As swept the board is a considerable understatement. Flying under

General Dynamics F-16 Fighting Falcon cutaway drawing key

1 Pitot tube
2 Glassfibre radome
3 Planar radar scanner
4 ILS glideslope aerial
5 Scanner drive units
6 Radar mounting bulkhead
7 ADF aerial
8 Forward electronics equipment bay
9 Westinghouse AN/APG-66 digital pulse doppler radar electronics
10 Forward identification light, Danish and Norwegian aircraft only
11 Radar warning antenna
12 Cockpit front pressure bulkhead
13 Instrument panel shroud
14 Weapons systems fire control electronics
15 Fuselage forebody strake fairing
16 Marconi-Elliot wide-angle raster-video head-up display (WARHUD)
17 Side stick controller (fly-by-wire control system)
18 Cockpit floor
19 Frameless bubble canopy
20 Canopy fairing
21 McDonnell Douglas ACES II zero-zero ejection seat
22 Pilot's safety harness
23 Engine throttle
24 Side console panel
25 Cockpit frame construction
26 Rear pressure bulkhead
27 Ejection seat headrest
28 Seat arming safety lever
29 Cockpit sealing frame
30 Canopy hinge point
31 Ejection seat launch rȃils
32 Rear electronics equipment bay (growth area)
33 Boundary layer splitter plate
34 Fixed geometry engine air intake
35 Lower UHF/IFF aerial
36 Aft retracting nosewheel
37 Shock absorber scissor links
38 Retraction strut
39 Nosewheel door
40 Forward position light
41 Intake trunking
42 Cooling air louvres
43 Gun gas suppression nozzle
44 Air conditioning system piping
45 Forward fuel tank, total system capacity 893 Imp gal (40.60 litres)
46 Canopy aft glazing
47 Starboard 308 Imp gal external fuel tank (1400 litres)
48 Forebody blended wing root
49 Upper position light and flight refuelling floodlight
50 Fuel tank bay access panel
51 Rotary cannon barrels
52 Forebody frame construction
53 M-61 Vulcan 20mm cannon
54 Ammunition feed and link return chutes
55 Ammunition drum, 515 rounds
56 Ammunition drum flexible drive shaft
57 Leading-edge flap control shaft
59 Hydraulic equipment service bay
60 Primary system hydraulic reservoir
61 Leading edge manoeuvre flap drive motor
62 TACAN aerial
63 No. 2 hydraulic system reservoir
64 Leading edge flap control shaft
65 Inboard pylon
66 Pylon fixing
67 Wing centre pylon
68 Triple ejector bomb rack
69 Mk 82 500-lb (227-kg) bombs
70 Oldelft Orpheus reconnaissance pod (Netherlands aircraft only)
71 Infra-red linescan
72 Camera ports
73 Reconnaissance pod pylon adaptor, centreline fixing
74 SUU-25E/A faire launcher
75 AN/ASQ aircraft instrumentation system data link transmitter
76 Outboard wing pylon
77 Missile launch shoe
78 AIM-9J Sidewinder air-to-air missile
79 Advanced medium range air-to-air missile (AMRAAM)
80 Aluminium honeycomb leading edge flap construction
81 Starboard navigation light
82 Static discharges
83 Fixed trailing edge section
84 Multi-spar wing construction
85 Integral wing fuel tank
86 Starboard flaperon
87 Fuel system piping
88 Access panels
89 Centre fuel tank bay access panel
90 Intake ducting
91 Wing mounting bulkheads
92 Universal air refuelling receptacle (UARSSI)
93 Engine compressor face
94 Pratt & Whitney F100-PW-2/100 afterburning turbofan engine
95 Jet fuel starter
96 Engine accessory gearbox, airframe mounted
97 Gearbox drive shaft
98 Ground pressure refuelling receptacle
99 Flaperon servo actuator
100 Rear fuselage frame construction
101 Rear integral fuel tank
102 Main engine mounting suspension link
103 Upper UHG/IFF aerial
104 Fuselage skin plating
105 Starboard side-body fairing
106 Fin root fillet
107 Flight control system hydraulic accumulators
108 Anti-collision light power supply unit
109 Starboard tailplane (increased area 'big tail')
110 Tailplane surfaces interchangeable port and starboard
111 Graphite-epoxy skin panels
112 Fin construction
113 Aluminium honeycomb leading edge panel
114 Steel leading edge strip
115 VHF communications aerial
116 Anti-collision light
117 Tail radar warning antennae
118 Aluminium honeycomb rudder construction
119 Rudder servo actuator
120 Radar warning power supply
121 Brake parachute housing Norwegian aircraft only
122 Tail navigation light



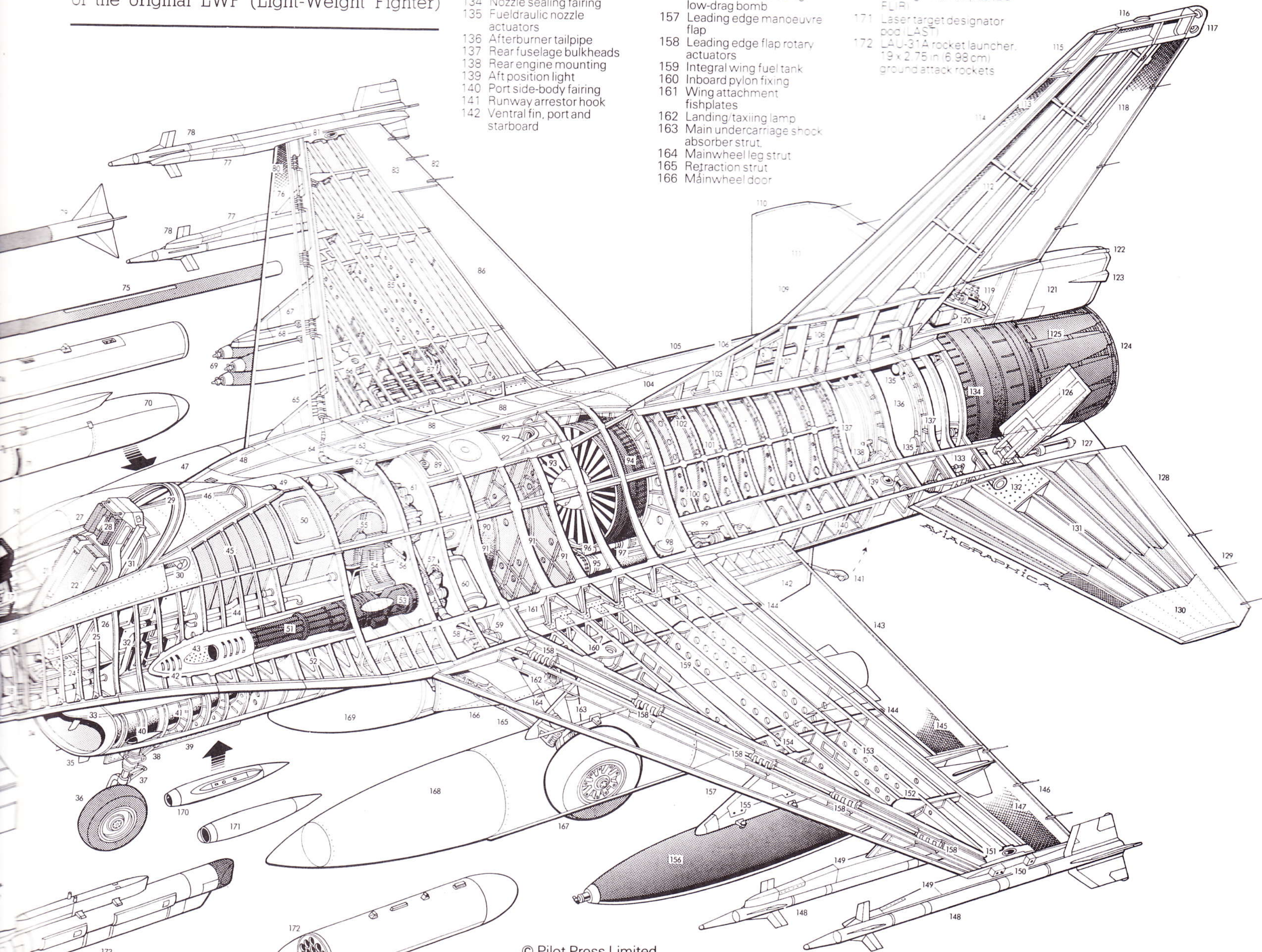
simulated war conditions, the new Fighting Falcons operated intensively for two days putting down free-fall 'iron bombs' on convoys of vehicles. Every bomb was delivered precisely on its assigned target, and the final score was a record 7,831 points out of the possible 8,000. A highly experienced RAF squadron flying SEPECAT Jaguars came second with 6,401 points, followed by many other squadrons including crack units flying F-111s and Buccaneers. In the 16 competition sorties against defending fighters (RAF Phantoms and Lightnings) the F-16s scored 86 kills for no losses. The combined score of the other teams was one kill set against 42 losses!

Based at RAF Lossiemouth, the F-16s in the competition proved their superb engineering design by averaging a turn-around time between sorties of only 10.5 minutes. Included in each turn-around was complete refuelling, and rearming with 515 rounds of 20-mm ammunition and six 227-kg (500-lb) Mk 82 bombs. The accuracy of navigation of the F-16s also set a new record, and at the end of the meeting the general feeling of the opposing teams was that they had suddenly become second-class citizens.

One of the fundamental design requirements of the original LWF (Light-Weight Fighter)

The phenomenal agility of the F-16 has earned the aircraft its adoption as the mount of the USAF's crack aerobatics team, 'The Thunderbirds'. Here they display the new colour scheme unveiled for the 1983 season.

123 Electronic countermeasures aerials, port and starboard (ECM)
124 Fully variable exhaust nozzle
125 Nozzle flaps
126 Split trailing edge airbrake upper and lower surfaces
127 Airbrake hydraulic jack
128 Port tailplane (increased area 'big tail')
129 Static dischargers
130 Graphite-epoxy tailplane skin panels
131 Corrugated aluminium sub-structure
132 Hinge pivot fixing
133 Tailplane servo actuator
134 Nozzle sealing fairing
135 Fueldraulic nozzle actuators
136 Afterburner tailpipe
137 Rear fuselage bulkheads
138 Rear engine mounting
139 Aft position light
140 Port side-body fairing
141 Runway arrestor hook
142 Ventral fin, port and starboard
143 Port flaperon
144 Flaperon hinges
145 Aluminium honeycomb flaperon construction
146 Static dischargers
147 Fixed trailing edge section
148 Port AIM-9J Sidewinder air-to-air missiles
149 Missile launcher shoe
150 Wing tip launcher fixing
151 Port navigation light
152 Outboard pylon fixing rib
153 Multi-spar wing construction
154 Centre pylon attachment rib
155 Wing centre pylon
156 Mk 84 2000-lb (908-kg) low-drag bomb
157 Leading edge manoeuvre flap
158 Leading edge flap rotary actuators
159 Integral wing fuel tank
160 Inboard pylon fixing
161 Wing attachment fishplates
162 Landing/taxiing lamp
163 Main undercarriage shock absorber strut
164 Mainwheel leg strut
165 Retraction strut
166 Mainwheel door
167 Forward retracting mainwheel
168 Port underwing fuel tank 308 Imp gal (1400 litres)
169 Centreline external fuel tank 308 Imp gal (1400 litres)
170 Electro-optical forward looking infra-red pod (EO-FLIR)
171 Laser target designator pod (LAST)
172 LAU-31A rocket launcher, 19 x 2.75 in (6.98 cm) ground attack rockets
173 Westinghouse AN/ALQ119-electronic suppression system radar jamming pod (ESM)
174 Snakeye 500-lb (227-kg) retarded bomb
175 GBU-10C/B 2000-lb (908-kg) laser guided bomb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F-16 Fighting Falcon in Action (continued)

specification that preceded the F-16 design was manoeuvrability superior to that of existing fighters. Despite its great increase in laden weight from 9798 kg (21,600 lb) to 11633 kg (25,646 lb) in the clean condition and from 12247 kg (27,000 lb) to 17010 kg (37,500 lb) with maximum external load, today's F-16 is stressed to make sustained turns at a crushing 9 g, which no other aircraft in the world (except possibly the MiG-29 'Fulcrum') can accomplish. The reclining seat helps the pilot to survive such brutal manoeuvres. Professional F-16 pilots hold divided opinions on whether lying back in a seat at a 30° angle really does increase g-tolerance, but the general view of thousands of pilots is that it gives a 1½ to 2 g advantage over an upright seat, with the ability to make sustained turns at over 8 g without onset of grey-out or tunnel vision, which the same pilots had experienced in other aircraft at 6.5 to 7 g.

Another big advantage is that, like all fighters of the 1980s, the F-16 has a cockpit designed to Hotas (hands on throttle and stick) principles. Every control the pilot needs in combat is to be found either on the handgrip of the single engine power lever or near the top of the stick with which the aircraft is flown. Like a concert pianist the pilot learns which finger or thumb to use to change the HUD (head-up display) symbology, alter the operating mode of the radar, open the airbrakes, fire Sidewinder missiles, fire the 20-mm six-barrel gun, drop bombs or do anything else necessary to hit ground targets or shoot down enemy aircraft. He need not look down inside the cockpit at all (unless something goes wrong inside the aircraft) or take his hands off the two vital handgrips.

Even the stick itself is unique so far as regular in-service fighters are concerned. For one thing it is not a normal control column between the pilot's knees but a short stubby handgrip on the right-hand console of the cockpit. The pilot can grip it whilst resting his arm in a comfortable padded rest, and if he wishes can also extend an extra rest for the wrist, so that even at 9 g his arm is supported along its length. Moreover, the stick is essentially fixed. If the pilot wishes to roll to the left he merely moves the handgrip to the left. The actual movement is microscopic, but the force exerted by the pilot is measured: the greater the force, the greater the rate of roll. At first this unique control column may cause overcorrections, because it is so powerfully and instantly responsive. After a while it becomes the link in the most perfect symbiosis between man and machine there has yet been in aviation. To quote an F-16 pilot; 'All I have to do is think what I want the ship to do and it happens.'

The F-16 has already chalked up a tremendous reputation, but there's a lot more to come. The F-16XL doubles the basic aircraft's wing area, vastly improves space for avionics and sensors, shortens its take-off and landing distances, doubles the weapons load and increases combat radius by 45%.

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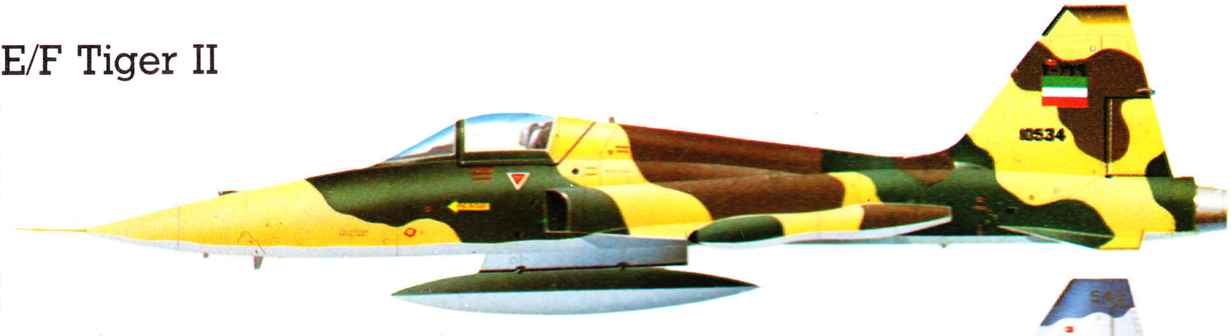
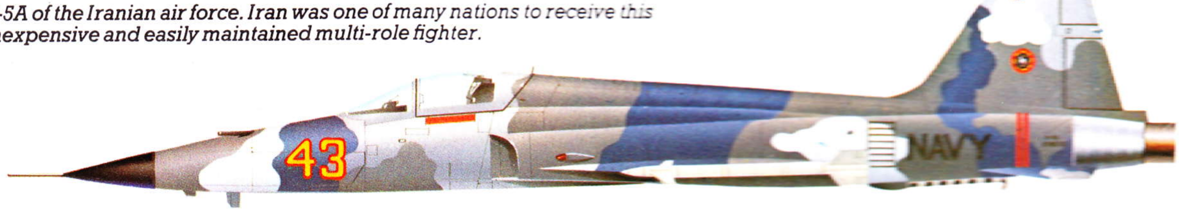
Standard F-16As have inherent provision to expand their systems to perform precision strike, night attack, beyond-visual-range interceptions and to launch air-to-air missiles at multiple targets.

USA

Northrop F-5E/F Tiger II



F-5A of the Iranian air force. Iran was one of many nations to receive this inexpensive and easily maintained multi-role fighter.



F-5E of a US Navy aggressor unit, who simulate Soviet aircraft for the benefit of Navy pilot training.

Northrop's F-5 family of lightweight fighters has racked up a remarkable sales total of more than 2,700 aircraft to 30 countries in spite of the fact that it was never adopted (or even marketed) as a major type in its own country! The original **Northrop N-156F Freedom Fighter** flew on 30 July 1959, with two 1850-kg (4,080-lb) thrust J85 engines and armed with two 20-mm cannon and two Sidewinder AAMs. After development, 1,040 were sold of the single-seat **F-5A** and two-seat **F-5B** version (plus a few of the **RF-5A** reconnaissance version), and others were built by Canadair, CASA and Fokker. The **F-5E Tiger II**, flown on 11 August 1972, has uprated engines fed via improved inlets, a wider fuselage housing more fuel, longer wing-root strakes and much better avionics including a small X-band radar. The tandem-seat **F-5F** flew on 25 September 1974. Sales of the F-5E/F have been even brisker than those of the F-5A/B, and 1,400 had been bought by 19 air forces by 1983. These are still rather limited aircraft, without all-weather intercept or attack capability, but they are tough, simple, cheap, beautiful to fly, extremely agile and not only useful as advanced trainers (the F-5E is used by the USAF and US Navy for Aggressors/Top Gun fighter pilot training) but also quite effective in simple wars in visual conditions. There is an **RF-5E Tigereye** with quick-change day/night reconnaissnce equipment and Northrop is offering such extras as a 30-mm underbelly gun pod, inertial navigation and various tactical sensors. The latest development of the series is the considerably more advanced **F-20 Tigershark** (originally designated **F-5G**). This changes to single-engine powerplant (a single afterburning General Electric F404 turbofan rated at 7257-kg (16,000-lb thrust) and offers far more comprehensive avionics. These latter include General Electric AN/APG-67 look-up/look-down multi-mode radar, Teledyne solid-state digital mission computer, AN/ALR-46 radar warning receiver and AN/ALE-40 countermeasures dispenser. More than 3630 kg (8,000 lb) of weapons can be carried, these including four AGM-65 Maverick missiles or three 30-mm cannon pods.

Specification:

F-5E Tiger II

Type: light tactical fighter

Armament: two 20-mm M39A-2 cannon each with 280 rounds; up to 3175 kg (7,000 lb) of external weapons including numerous bombs, rockets, Maverick ASMs, clusters, pods and tanks

Powerplant: two 2268-kg (5,000-lb) thrust General Electric J85-21A afterburning turbojets

Performance: maximum speed, clean at high altitude 1734 km/h (1,077 mph) or Mach 1.63; initial climb rate 10515 m (34,500 ft) per minute; service ceiling 15790 m (51,800 ft); radius on a lo-lo-lo mission with maximum weapons and reserves 222 km (138 miles)

Weights: empty 4392 kg (9,683 lb); maximum take-off 11193 kg (24,676 lb)

Dimensions: span 8.13 m (26 ft 8 in); length 14.68 m (48 ft 2 in); height 4.06 m (13 ft 4 in); wing area 17.3 m^2 (186.0 sq ft)

Above: Touching down at Dübendorf, this Northrop F-5E is operated by the armed forces of Switzerland. The original order in 1976 called for 66 F-5Es and six F-5Fs.

Below: The F-20 Tigershark is the third major stage of F-5 development. Unlike its predecessors, it has a single engine, with rear fuselage width maintained by lateral 'shelves'.

F-20
F-20 Tigershark
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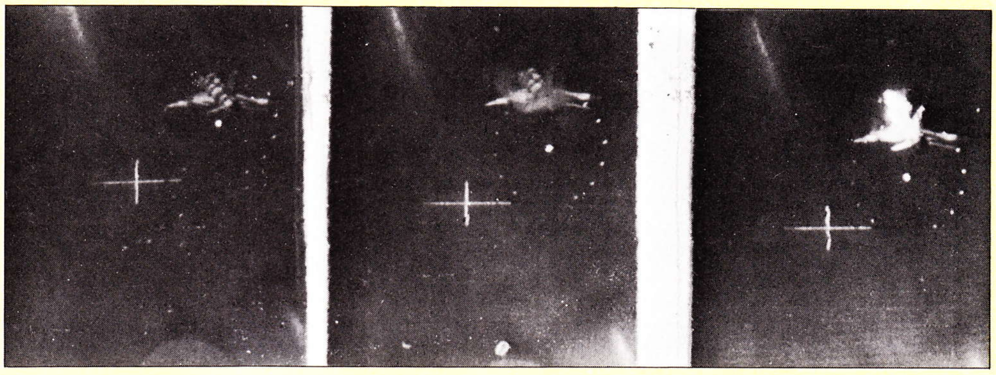
Yom Kippur Air War



Camera-gun sequence shows the death of an Arab MiG-21 seen through the sights of an Israeli Mirage.

For once, Israel was caught off its guard: traditional vigilance relaxed for the celebration of Yom Kippur, the Day of Atonement fast. Intent on regaining the territory so humiliatingly seized from them in the 1967 conflict, Egyptian and Syrian forces checked and rechecked their equipment, impatient for the order to move. It was 6 October 1973, and another Middle East war was about to begin.

Throwing bridges over the Suez Canal, 70,000 Egyptian troops and 400 tanks overwhelmed the Israeli defences on the eastern bank and thrust into Sinai, whilst in a simultaneous onslaught in the north-east, Syria attacked positions on the strategically vital Golan Heights. Israel was trapped in a war on two fronts, and there was little doubt that the Arabs would not stop at reclaiming lost areas. It would be a fight for Israel's survival.

Galvanized into action, Israeli McDonnell Douglas F-4 Phantoms, McDonnell Douglas A-4 Skyhawks and Dassault Mirage IIIs launched counterstrikes against the advancing armies and their rearward bases, but it soon became apparent that they were fighting a new kind of air war. The Arabs had taken pains to protect their forces against air attack, having learnt from bitter experience in the Six-Day War of six years earlier, and as IDF/AF aircraft crossed the Suez Canal they were greeted by a barrage of Soviet-made SA-2 and SA-3 SAMs from well-prepared sites. Mobile SA-6 missile-launchers and the highly-effective ZSU-23-4 cannon were also deployed, as were SA-7 infantry SAMs, and the Israelis were horrified to find that their ECM were useless against the SA-6.

Heavyweight amongst the Israeli air power was the McDonnell Douglas F-4 Phantom II, one of which is seen here attacking an Egyptian SAM site.

Losses to SAMs

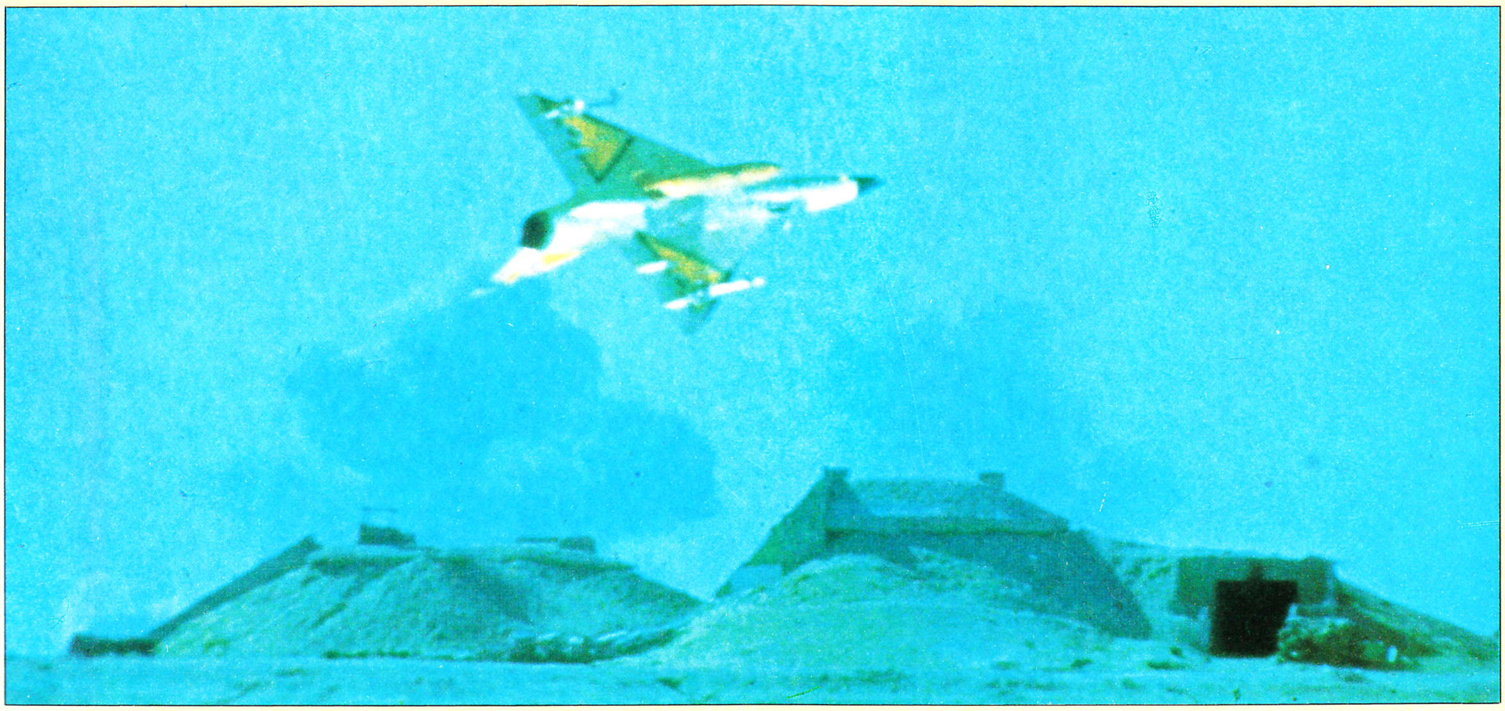
Compared with earlier wars, the result of this efficient defence was catastrophe for Israel, which suffered the loss of some 90-100 aircraft to SAMs out of a total of 120 from all causes. Such was the effectiveness of Arab SAMs that when an Israeli force crossed the Canal on the tenth day of the war its initial objective was to eliminate the anti-aircraft defences. Outside the range of the deadly missiles, however, the IDF/AF proved that it had lost none of its prowess in air combat, destroying some 220 Syrian and 213 Egyptian aircraft, or half of the Arab front-line strength. It was this inability to gain control of the air which led to failure of the Arab assault despite its promising beginning.

The desperate nature of the combat (and some measure of its ferocity) is indicated by the fact that 375 Israeli aircraft were opposed by 310 from Egypt and 420 from Syria, with Iraq adding 30 to the latter early in the conflict. No fewer than 81 IDF/AF aircraft were destroyed in the first four days of fighting, during which 3,555 sorties were flown, but losses fell dramatically thereafter as Israel slowly gained the upper hand, the overall total of 120 shot down being incurred during 12,271 missions.

The IDF/AF thus suffered one loss per 102 sorties despite the Arab SAM menace, its opponents faring less well in the face of determined Israeli action, Syria losing one per 28 and Egypt one per 24 sorties.

It had been a close-run war, however, and Israel was quick to appreciate the lessons so forcibly driven home. For the fighter, this meant high priority in provisions of electronic countermeasures against enemy radars and emphasis on agility in new aircraft designs. Now the IDF/AF is equipped with the highly manoeuvrable General Dynamics F-16 Fighting Falcon, and its Phantoms and Skyhawks appear able to jam the SA-6's guidance systems at will. The observance of Yom Kippur has taken on an additional meaning in Israel, its air force being stronger and better equipped as a result.

SAMs accounted for a large proportion of Israel's losses, but her pilots soon evolved tactics to deal with them. Here a Mirage III rolls into an attack on an Egyptian SAM site.



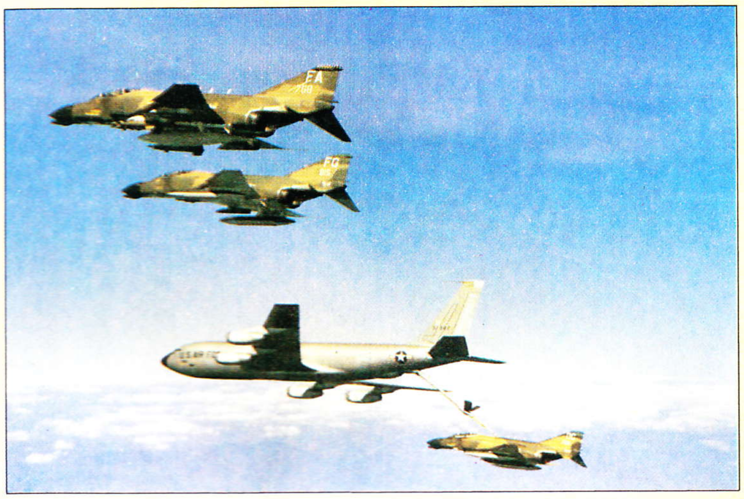
USA

McDonnell Douglas F-4 Phantom II

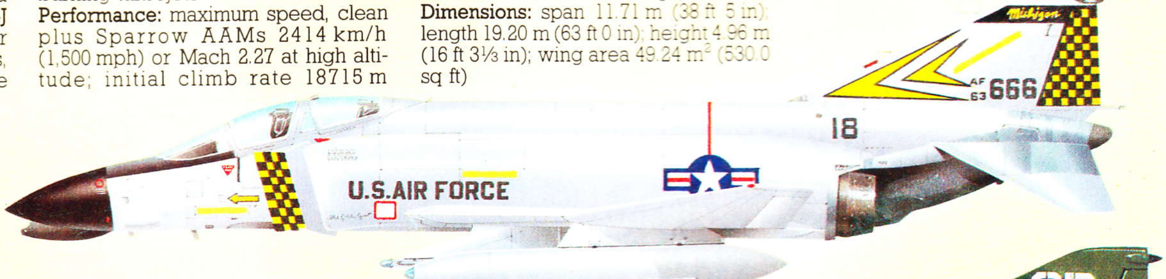
Planned as a multi-role attack aircraft, the **McDonnell Douglas F-4 Phantom II** eventually reached the US Navy as a fleet defence fighter with no weapons except AAMs (carried in a novel way, with four large Sparrows recessed under the broad fuselage for minimum drag) and just one pylon for a single drop tank. Soon world records were being set for speed, climb and ceiling, and when bombs were carried it was clear the Phantom was a world-beater. The USAF bought the AN/APG-100 radared **F-4C** minimum-change version of the US Navy's **F-4B** (AN/APG-72 radar), and then the **F-4D** more closely tailored (particularly in avionics, with AN/APG-109A radar) to its own needs which were biased towards ground attack. The RF-4 family emerged as the world's fastest and most fully equipped unarmed tactical reconnaissance aircraft, in the form of the **RF-4B** for the US Marine Corps, **RF-4C** for the US Air Force and **RF-4E** for export. Vietnam experience led to the final and most important fighter model, the **F-4E** with improved radar (AN/APG-120 solid-state set in a smaller radome), more power, more internal fuel, an internal 20-mm rotary-barrel gun and a slatted wing for better manoeuvrability at high weights. The UK bought a largely redesigned version (the **F-4K** for the Fleet Air Arm and **F-4M** for the RAF, designated **Phantom FG.Mk 1** and **Phantom FGR.Mk 2** respectively) with Rolls-Royce Spey turbofan engines, whose great power was largely dissipated in increased aircraft drag. Germany's Luftwaffe is modifying its slatted **F-4F** fleet to carry the advanced AMRAAM missile, with a new radar, and its RF-4E fleet to drop bombs. Japan built its own **F-4EJ** model. The last sub-type to emerge is the **F-4G** dedicated EW (electronic-warfare) aircraft, used by the USAF Tactical Air Command and USAF Europe, and produced by conversion of F-4Es. It combines complex AN/APR-38 sensor, analyser and jammer systems with special air-to-ground weapons including Shrike, Standard ARM, Maverick and HARM. The **F-4J** was the ultimate new-build version for the US Navy and US Marine Corps, based on the F-4B but fitted with more powerful engines, a slotted tailplane, drooping ailerons and improved avionics, including AN/AWG-10 fire-control radar and an AN/AJB-7 bombing system. F-4Js were later upgraded to **F-4S** standard with avionics improvements and leading-edge slats. The **F-4N** was an upgraded F-4B.

RAF Phantom FGR.Mk 2 (F-4M) of No. 92 Sqn based in Germany. All RAF air-defence Phantoms are now painted in low-visibility grey. They usually fly with AIM-9L Sidewinders and BAe Sky Flash missiles.

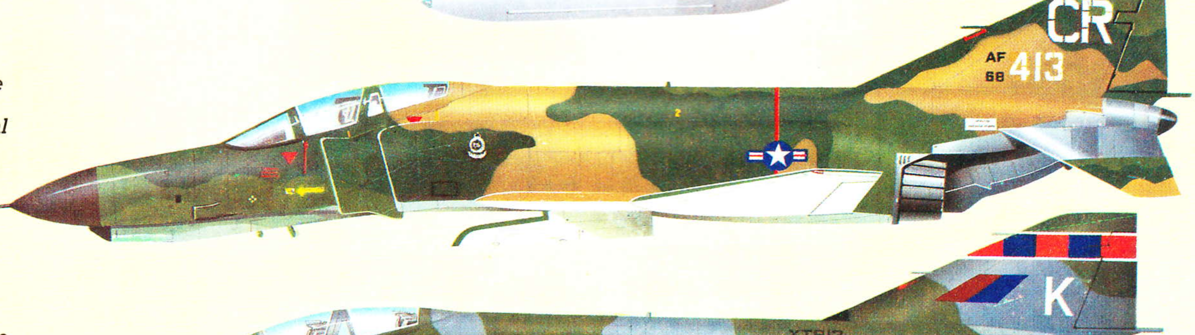
Specification:
F-4E Phantom II
Type: multi-role fighter
Armament: one 20-mm M61 gun under nose; four Sparrow (later AMRAAM) AAMs recessed under fuselage (one may be replaced by ECM pod), and up to 7258 kg (16,000 lb) of assorted stores on wing pylons including air-to-ground weapons, tanks, two more Sparrows or four Sidewinder AAMs
Powerplant: two 8120-kg (17,900-lb) thrust General Electric J79-17 afterburning turbojets
Performance: maximum speed, clean plus Sparrow AAMs 2414 km/h (1,500 mph) or Mach 2.27 at high altitude; initial climb rate 18715 m (61,400 ft) per minute; service ceiling 18975 m (62,250 ft); range on internal fuel only without weapons 2817 km (1,750 miles)
Weights: empty 13757 kg (30,328 lb); maximum take-off 27500 kg (60,360 lb)
Dimensions: span 11.71 m (38 ft 5 in); length 19.20 m (63 ft 0 in); height 4.96 m (16 ft 3⅓ in); wing area 49.24 m² (530.0 sq ft)



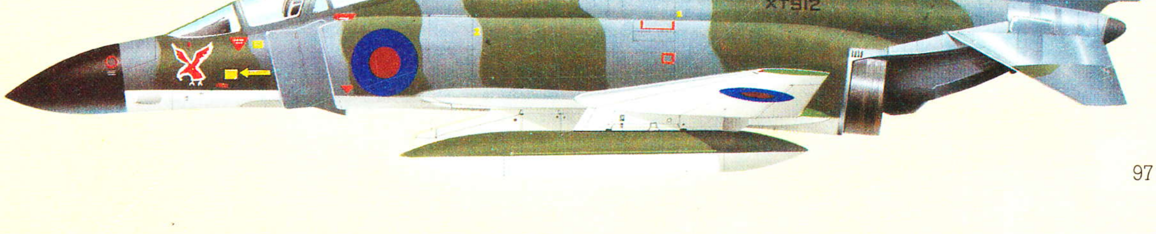
A trio of F-4D Phantoms line up to take on fuel from a Boeing KC-135 tanker before a strike into North Vietnam. The F-4 proved its worth in Vietnam, emerging as a genuine multi-role fighter.



The F-4C was the original 'minimum change' model for the US Air Force. This 1963 example, with infra-red seeker under the nose, was serving with the 171st FIS of the Michigan ANG in 1980.



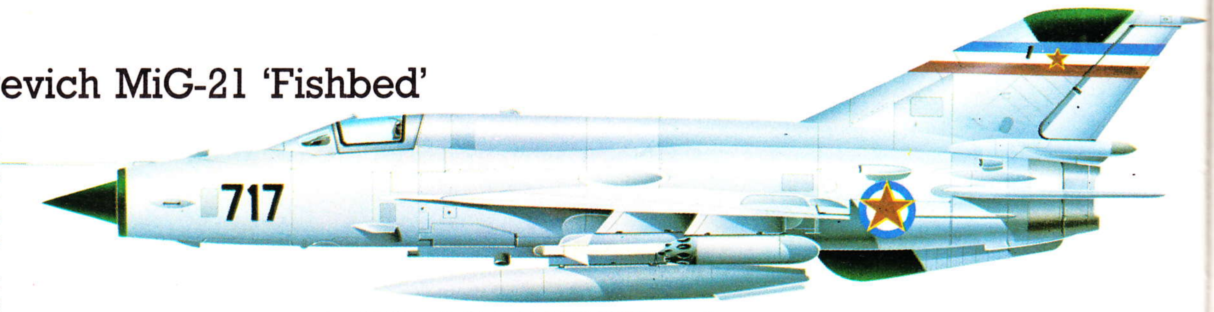
Final model of fighter Phantom, the F-4E introduced more power and fuel, and was later given an internal gun and slats. This F-4E was assigned to the 32nd TFS at Camp Amsterdan (Soesterberg), Netherlands.



Phantom FGR.Mk 2 (F-4M) of No. 23 Sqn, RAF, based at Wattisham in 1976. This unit has now also adopted the air superiority grey. They are now the Falklands air defence unit, renumbered from No. 29 Sqn.

USSR

Mikoyan-Gurevich MiG-21 'Fishbed'



Yugoslavia operates around 200 MiG-21s, of which this MiG-21MF complete with AA-2 'Atoll' air-to-air missiles is an example.

In 1954 the MiG and Sukhoi design teams each went ahead with prototypes to test two new configurations for supersonic combat aircraft. Eventually the acutely swept wing plus swept tail was judged best for attack aircraft, resulting in the Sukhoi Su-7, while the tailed delta gave highest performance for a fighter and was adopted for what became the **Mikoyan-Gurevich MiG-21 'Fishbed'**. Early MiG-21s reached the Soviet Frontal Aviation and PVO defence force in 1959, and were very simple aircraft just able to carry two cannon (sometimes only one, to save weight) and two small AA-2 missiles. Powered by the R-11 rated at 5750-kg (12,676-lb) thrust with afterburner, the MiG-21 reached Mach 2 and was a joy to fly. Over the next quarter-century the MiG-21 became the most prolific fighter in the world, with about 15,000 built in 15 major and over 100 minor versions, plus corresponding two-seat trainers. Each successive major model has featured more thrust or better avionics or a greater or better spectrum of weapons. All recent versions have the R-11-300, or R-11F2S-300, or R-13-300 or R-25 engine fed by an enlarged duct with an all-weather radar in the centrebody cone. Drag is reduced by progressively larger dorsal fairings which in some models contain fuel, and there are numerous options of reconnaissance sensors and EW (electronic warfare) systems. Large numbers continue to be built in India and China; the latter designates the type the **Xian J-7** for indigenous use and **F-7** for export. Some of the major versions of the Soviet 'Fishbed' series are the **MiG-21PF 'Fishbed-D'** limited all-weather fighter with R1L radar; **MiG-21FL** export versions of the MiG-21PF with R2L radar and provision for a gun pod; **MiG-21PFM 'Fishbed-F'** improved version of the MiG-21PF with forward- rather than side-hingeing canopy and R2L radar; **MiG-21PFMA 'Fishbed-J'** multi-role version of the MiG-21PFM with four hardpoints and provision for a GSh-23 cannon pack; **MiG-21R 'Fishbed-H'** tactical reconnaissance version of the MiG-21PFMA; **MiG-21MF 'Fishbed-J'** upengined version of the MiG-21PFMA; **MiG-21bis 'Fishbed-L'** third-generation fighter with much improved avionics and structure; **MiG-21bis 'Fishbed-N'** definitive third-generation fighter with more powerful R-25 engine; and **MiG-21U 'Mongol'** tandem two-seat trainer in several variants.

Specification:

MiG-21bis 'Fishbed-N'

Type: multi-role fighter

Armament: one 23-mm GSh-23 twin-barrel gun with 200 rounds; maximum of 1500 kg (3,307 lb) of ordnance carried on four wing pylons, including two 500-kg (1,102-lb) and two 250-kg (551-lb) bombs or other stores in attack missions, or four AA-2-2 'Advanced Atoll' AAMs or two AA-2-2 and two AA-8 'Aphid' AAMs in air-to-air role

Powerplant: one 7500-kg (16,535-lb) thrust Tumansky R-25 afterburning turbojet

Performance: maximum speed, clean at high altitude 2285 km/h (1,420 mph) or Mach 2.15; initial climb rate 17700 m (58,070 ft) per minute; service ceiling 15000 m (49,210 ft); range at high altitude (with internal fuel only) 1100 km (683 miles)

Weights: empty about 5715 kg (12,600 lb); maximum take-off 9400 kg (20,725 lb)

Dimensions: span 7.15 m (23 ft 5½ in); length, excluding probe typically 15.10 m (49 ft 7 in); height 4.10 m (13 ft 5½ in); wing area 23.0 m^2 (247.6 sq ft)

Комсомольская гарантия
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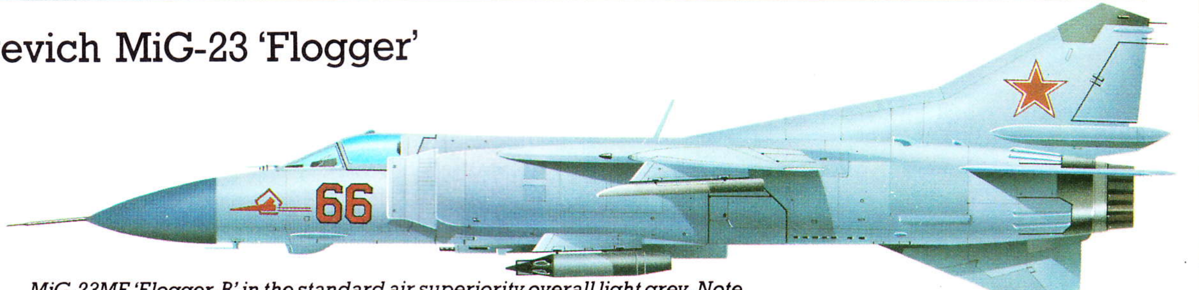
Still in front-line service with the Soviet air forces, the MiG-21 is a versatile and potent weapon. About 15,000 have been produced.

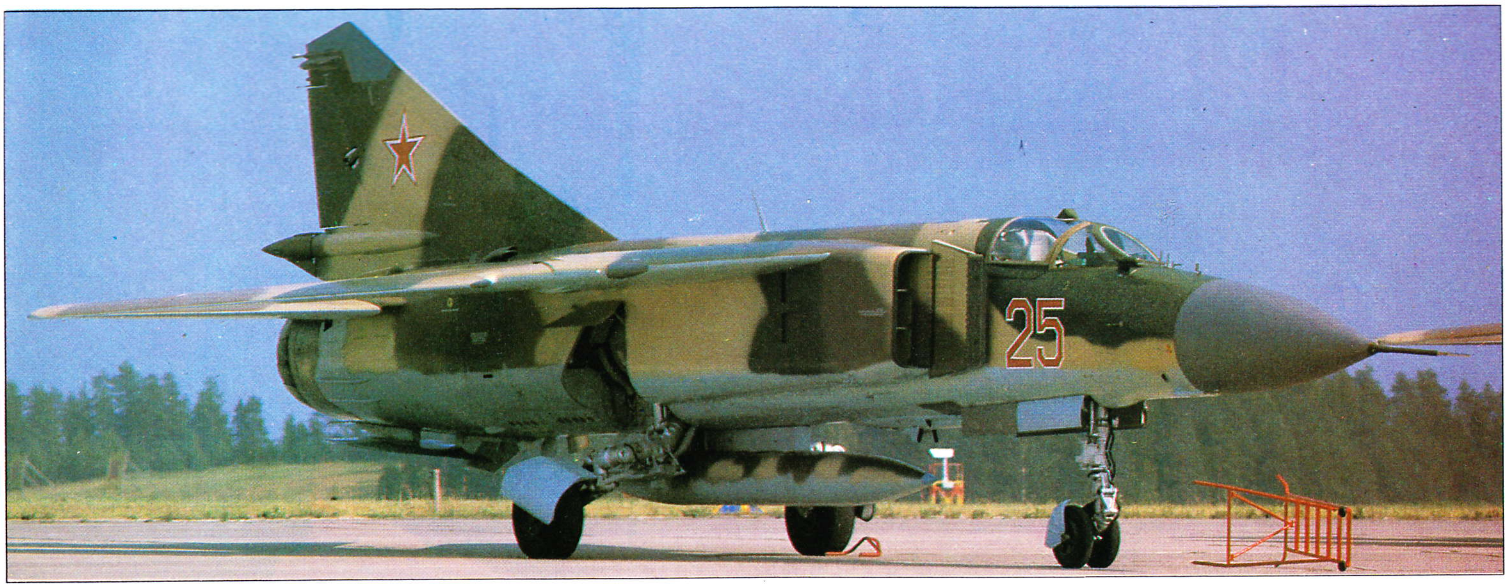
USSR

Mikoyan-Gurevich MiG-23 'Flogger'



MiG-23MF 'Flogger-B' in the standard air superiority overall light grey. Note the rocket pods and AAM launching shoes.

The Soviet Union's standard shape for an optimized swing-wing aircraft was perfected in 1964 and assigned to Sukhoi for a large twin-engine aircraft and to the MiG OKB (design bureau) for a smaller aircraft with one engine. The MiG prototype (designated E-231) was publicly flown in 1967, but considerable redesign was needed and production of the **Mikoyan-Gurevich MiG-23 'Flogger'** series did not start until 1970, with a different engine. Since then the rate of delivery has surpassed that of all other combat aircraft, and 10 basic sub-families have been identified, all named 'Flogger' by NATO but divided by the Soviets into MiG-23 and MiG-27 families. Both the FA (Frontal Aviation) and IA-PVO (Air-Defence Forces) of the Soviet Union use MiG-23 interceptor variants with large multi-mode nose radar ('High Lark' with a search range of 85 km/53 miles and a tracking range of 54 km/34 miles), fully variable engine inlets and AAM armament. The FA also uses the **MiG-27** attack aircraft (**'Flogger-D'** and **'Flogger-J'**) with a tapered downsloping nose packed with air-to-ground sensors, large armour plates round the cockpit and fixed inlets. All have full-span flaps, outboard leading-edge flaps, roll control by spoilers and tailerons, rough-field main gear folding into the fuselage, and a large ventral fin which folds sideways for take-off and landing. Deliveries to 17 air forces exceeded 2,600 by the spring of 1983, and the main operational variants of the MiG-23 series are the **MiG-23MF 'Flogger-B'** single-seat air-combat fighter, with limited look down/shoot down capability; the **MiG-23U 'Flogger-C'** two-seat combat-capable con-



The MiG-23 is by far the most important aircraft in the Soviet inventory. Capable of a variety of missions, it appears in many versions, of which this is the 'Flogger-G'.

version trainer; the **MiG-23 'Flogger-E'** export version of the 'Flogger-B' with less capable avionics including 'Jay Bird' radar matched to AA-Z 'Atoll' air-to-air missiles; the **MiG-23BN 'Flogger-F'** export close-support and interdictor aircraft combining the nose section of the 'Flogger-D' with the powerplant, variable-geometry inlets and GSh-23 twin-barrel 23-mm cannon of the MiG-23 series; the **MiG-23MF 'Flogger-G'** variant of the 'Flogger-B' with a smaller dorsal extension to the fin; and the **MiG-23BN 'Flogger-H'** variant of the 'Flogger-F' with extra avionics.

Specification:

MiG-23MF 'Flogger-B'

Type: variable-geometry air-combat fighter

Armament: one GSh-23 twin-barrel 23-mm cannon, and up to 2000 kg (4,409 lb) of stores on five hardpoints; the most common air-to-air weapons are the AA-7 'Apex' and AA-8 'Aphid' air-to-air missiles

Powerplant: one 12,475-kg (27,502-lb) afterburning thrust Tumansky R-29B turbojet

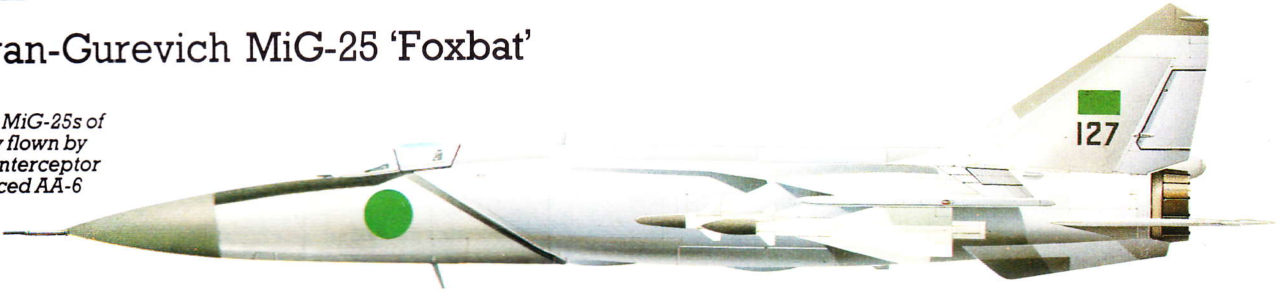
Performance: maximum speed about 2,500 km/h (1,553 mph) or Mach 2.35 at altitude; service ceiling 18600 m (61,025 ft); combat radius about 1200 km (746 miles)

Weight: maximum take-off 16000 kg (35,273 lb)

Dimensions: span spread 14.25 m (46 ft 9 in) and swept 8.17 m (26 ft 9½ in); length 16.80 m (55 ft 1½ in); wing area about 37.0 m^2 (398.3 sq ft)

USSR

Mikoyan-Gurevich MiG-25 'Foxbat'



Libya reportedly has 36 MiG-25s of various kinds, probably flown by Soviet pilots. This is an interceptor armed with four advanced AA-6 'Acrid' radar missiles.

Designed specifically to intercept the B-70 Mach 3 bomber (which never went into service) the **Mikoyan-Gurevich MiG-25 'Foxbat'** was designed for speed at the expense of such other attributes as short field-length, combat manoeuvrability, modest weight and economic cost. The E-266 prototypes were displayed in 1967 and caused a great stir among Western observers, a stir heightened by a string of world records for speed (often over long ranges with heavy payloads) and astonishing rate of climb and high altitude, such as a climb from rest to 35000 m (114,829 ft) in 4 minutes 11 seconds. The basic **MiG-25 'Foxbat-A'** interceptor, an example of which was flown to Japan by a defector in September 1976, is made mainly of steel, with titanium or its alloys around the engines and on leading edges. The unswept wing is thin and sharp-edged, and has a fixed leading edge and plain flaps and ailerons. Large fuel tankage is provided in 11 welded steel tanks built into the airframe, and the low-pressure turbojets have giant afterburners and fully variable inlets with water/alcohol sprays. The giant radar is typical of 1959 technology and is associated with comprehensive EW systems and various AAMs. At least two types of **MiG-25R** (identified by NATO as **'Foxbat-B'** and **'Foxbat-D'**) carry large cameras, infra-red and radar reconnaissance systems, and the **MiG-25U 'Foxbat-C'** trainer has a second cockpit replacing the radar. The latest version of the MiG-25 (possibly the MiG-25M) is the **'Foxbat-E'**, which is the 'Foxbat-A' converted with a look-down/shoot-down radar/weapon fit of limited capability, possibly comparable with that of the 'Flogger'. The **MiG-31 'Foxhound'** is a replacement with more thrust from Tumansky R-15 engines and later weapons and radar (and possibly with a gun and second seat); the missile fit comprises four radar-homing AA-9 weapons under the wings and four shorter-range AA-8 'Aphid' weapons for self-defence.

Specification:

MiG-25 'Foxbat-A'

Type: all-weather stand-off interceptor

Armament: four AAMs (usually AA-6 'Acrid')

Powerplant: two 11000-kg (24,250-lb) thrust Tumansky R-31 afterburning turbojets

Performance: maximum speed, clean at high altitude (dash) 3400 km/h (2,115 mph) or Mach 3.2, or (sustained) 2978 km/h (1,850 mph) or Mach 2.8; initial climb rate 12480 m (40,950 ft) per minute; service ceiling 24400 m (80,000 ft); radius at high altitude 1125 km (700 miles)

Weights: empty 20095 kg (44,300 lb); maximum take-off 36200 kg (79,800 lb)

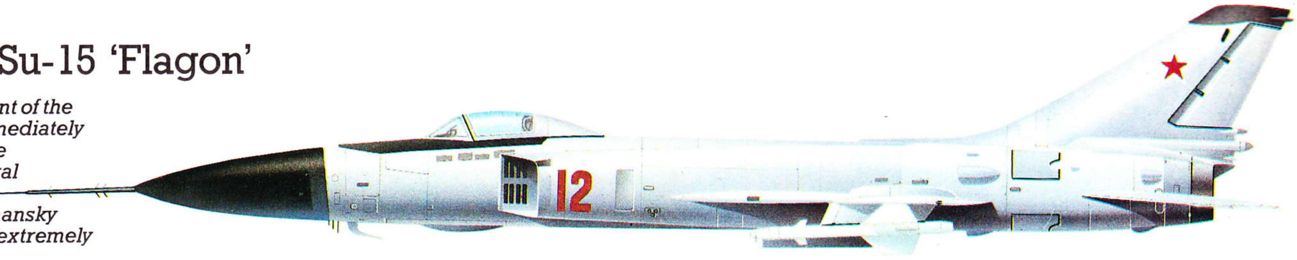
Dimensions: span 13.95 m (45 ft 9 in); length 23.82 m (78 ft 1¾ in); height 6.10 m (20 ft 0¼ in); wing area 56.83 m^2 (611.7 sq ft)

Early exposure to the MiG-25 caused grave consternation to Western defence analysts.

USSR

Sukhoi Su-15 'Flagon'

The final operational variant of the Su-15 is the 'Flagon-F'. Immediately distinguishable by its more aesthetically pleasing ogival radome, this version also incorporates uprated Tumansky R-13F-300 engines, giving extremely high performance.



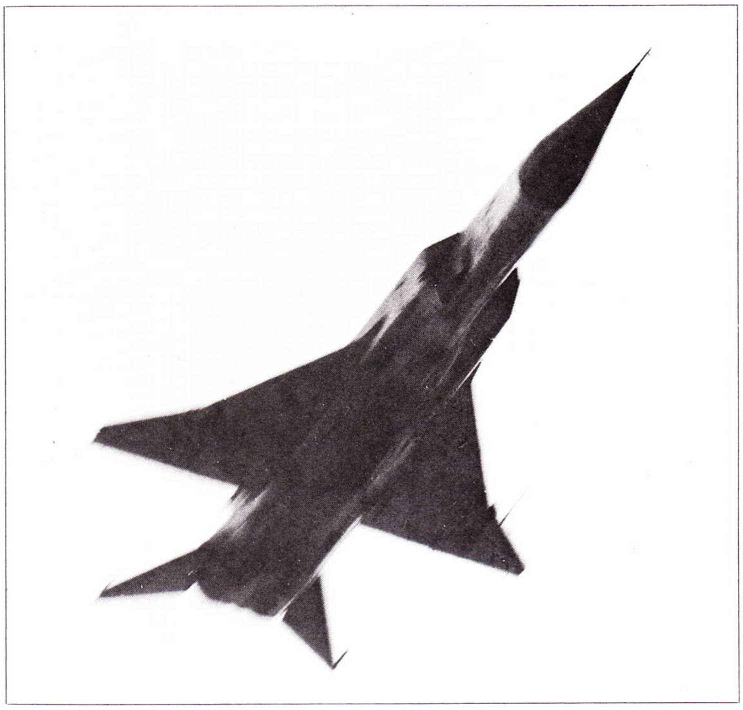
With a Soviet requirement for a Mach 2.5 interceptor in the 1960s, the Sukhoi design bureau adapted the existing **Su-11** to take twin Tumansky R-11 afterburning turbojets and a large radar nose. The result was the **Su-15 'Flagon'**, the first prototype of which flew in 1965. The original R-11 engines have since been replaced by more powerful R-13s, making these aircraft among the world's fastest fighters.

The Su-15's original armament of AA-8 'Aphid' close-range and two or four AA-3 'Anab' longer-range missiles are being replaced by a new missile believed to be the AA-X-9. Despite some reports to the contrary there is no evidence that the aircraft carries an internal cannon, though this could be fitted as an external pod. Unlike Frontal Aviation aircraft, which regularly use roads as strips, the Su-15 needs a long paved runway of 2000-3000 m (6560-9840 ft), and streams its drag chute on landing. The Su-15 carries a comprehensive internal fit of highly capable electronic warfare systems.

Current service versions of the Su-15 are the **'Flagon-E'** and **'Flagon-F'** single-seat interceptors, recently involved in the downing of a South Korean civil Boeing 747. Also operated are **'Flagon-C'** two-seat trainers. Approximately 700 Su-15s are still in service, but the type is steadily being replaced by the all-weather interceptor MiG-23 'Flogger-G' and MiG-25 'Foxbat'.

Specification:
Sukhoi Su-15 'Flagon-F'

Type: all-weather interceptor
Armament: two AA-3 'Anab' missiles; body pylons could carry two more but are usually empty or used for tanks
Powerplant: two 6600-kg (14,550-lb) thrust Tumansky R-13F-300 afterburning turbojets
Performance: maximum speed, clean at high altitude 2660 km/h (1,653 mph) or Mach 2.5; combat radius at high altitude with two AAMs 725 km (450 miles)
Weights: empty probably about 10000 kg (22,046 lb); maximum take-off estimated at 16000 kg (35,274 lb)
Dimensions: (estimated) span 10.53 m (34 ft 6 in); length 20.5 m (68 ft 0 in); height 5.0 m (16 ft 6 in); wing area about 35.7 m^2 (384.3 sq ft)

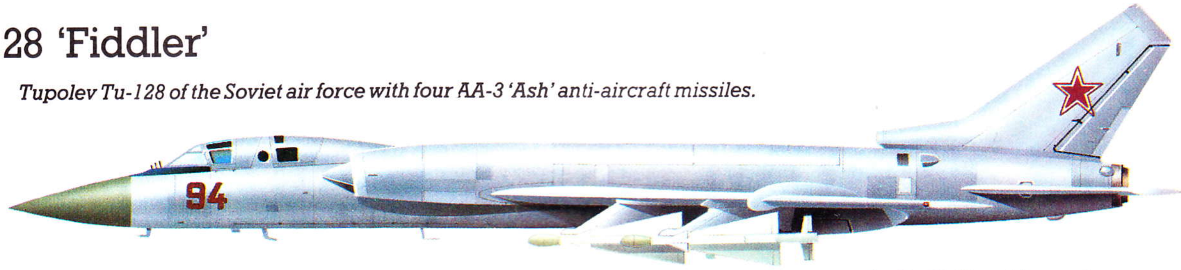


The prototype Su-15 'Flagon-B', with lift-jets incorporated in the fuselage (used only on this variant), but also showing the distinctive kinked delta planform of subsequent models.

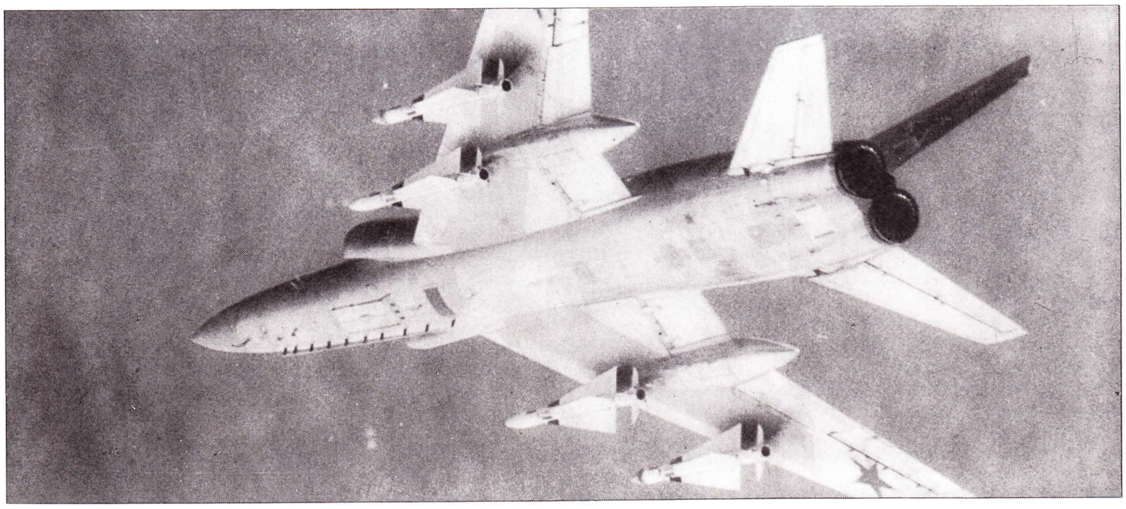
USSR

Tupolev Tu-128 'Fiddler'

Tupolev Tu-128 of the Soviet air force with four AA-3 'Ash' anti-aircraft missiles.



When first seen in 1961, this large supersonic twin-jet was thought by Western observers to be a Yakovlev design. In fact it was the **Tupolev Tu-28** long-range surveillance fighter, from which was derived the **Tu-28P 'Fiddler'** interceptor. The Tupolev bureau numbers for these two types were Tu-102 and **Tu-128**. In many respects the largest fighter in the world, and certainly the biggest and most powerful ever put into service, the Tu-128 has a long fuselage with enormous fuel capacity to handle PVO (air defence force) missions covering vast areas of the Soviet frontier. The original Tu-28 was intended to operate almost without ground help, but the Tu-128 is assisted by ground radars and defence systems which guide it towards hostile aircraft. Then the extremely large 'Big Nose' I/J-band radar takes over until either a radar- or an IR-homing AA-3 missile can be fired. A pair of each type of AAM is carried, and no other interceptor has been seen armed with these large weapons. The weight of this fighter is spread by bogie landing gears which in flight retract backwards into fairings typical of Tupolev aircraft of the era. Capability against low-flying aircraft may have been improved since 1980, because not even the Su-27 (Ram-K) or an interceptor version of Su-24 could offer equal area defence, but the 100-odd still in use were being withdrawn in 1983.



Specification:
Tu-128 'Fiddler'

Type: long-range interceptor
Armament: four AA-3 'Ash' AAMs, two radar-guided and two IR-homing
Powerplant: two afterburning turbojets, almost certainly Lyulka AL-21F-3 each rated at 11000-kg (24,250-lb) thrust
Performance: maximum speed at high altitude 1900 km/h (1,200 mph) or Mach 1.8; service ceiling 20000 m (65,615 ft); radius at high altitude with four AAMs 1250 km (777 miles)
Weights: (estimated) empty 24500 kg (54,012 lb); maximum take-off 40000 kg (88,183 lb)
Dimensions: span 18.10 m (60 ft 0 in); length 27.20 m (89 ft 3 in); height 7.0 m (23 ft 0 in); wing area 80.0 m^2 (860 sq ft)

The world's biggest fighter, the Tupolev Tu-128, is in service with the Soviet air force. Deployed to remote areas, they have an incredible endurance of eight hours.

US Rapid Deployment Force

Part 1

Sikorsky UH-60 Black Hawks disembark troops. Air-transportable by C-5 Galaxy, C-141 StarLifter or C-130 Hercules, the Black Hawk is armed with up to 16 Hellfire missiles, and can carry 11 fully-armed infantrymen.

As from 1 January 1983 the American Rapid Deployment Joint Task Force became a new Command known as US Central Command, or USCENTCOM, under the control of the US Joint Chiefs of Staff. This upgrading to command level of a force that has grown in numbers and importance since its conception during the term of office of President Carter is significant, for it marks the 'coming of age' of a force that had more than its fair share of being a political football, and it also marks the arrival on the global scene of a new factor on the chess board of world military power.

The new command is still widely known by its abbreviated designation of the Rapid Deployment Force (RDF), and the new command title will gradually be assumed and become more familiar as time progresses. Its future is now certain, despite many political attempts either to do away with it entirely or to attenuate its numbers and scope; but it is still in the throes of organization and establishment, so some of the planned details given below may yet be altered.

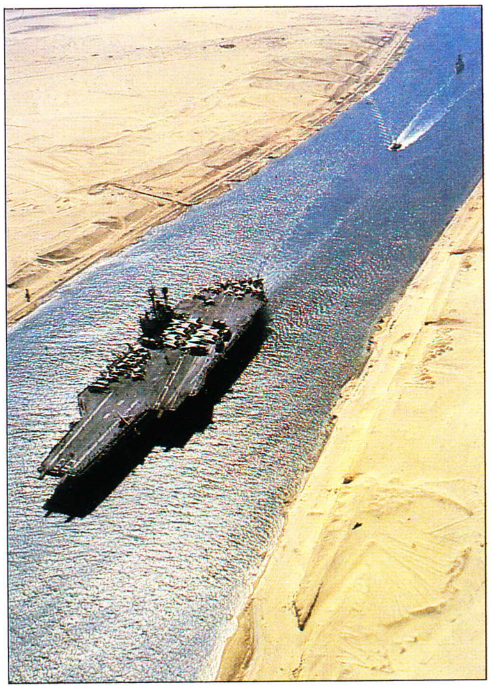
During 'Exercise Bright Star '82' USAF Tactical Air Command deployed F-16 Fighting Falcons direct from Hill AFB, Utah, to Egypt in a 14-hour non-stop flight.

Headquarters and tasks

The headquarters of the RDF is at MacDill Air Force Base in Florida. The commander is a lieutenant general of the US Army, and under his command he has 230,000 personnel under a unified command that embraces US Army, US Navy, US Air Force and US Marine Corps units. The task of the RDF is wide and largely undefined, based mainly on the fact that the RDF will be called upon to protect the interests of the United States and its allies in an area known as South West Asia (SWA). This operational area takes in 20 countries but specifically excludes Israel. The main centre of interest centres on the area containing the Middle East oilfields and includes such sensitive nations as Iran and Iraq (already at war with each other) and the other smaller Persian Gulf states. Put bluntly in such terms the RDF appears to be but a force to protect American business interests, but the wider intention is to deter Soviet aggression in the area, for one of the more important Soviet foreign policy objectives has for many decades been the establishment of a blue-water port as an outlet to the Indian Ocean.

The headquarters is at present a long way from its intended theatre of operations and moves have already been made to establish a forward headquarters somewhere in the SWA region. To date these efforts have been unsuccessful, mainly as a result of the political considerations that make the region such a source of potential conflict. The plan for a full move to the region has now been replaced for the time being with a scheme to establish a much smaller forward headquarters of only about 200-300 personnel in the SWA theatre, but in mid-1983 negotiations for this were still in progress.

The USN component of the Rapid Deployment Force includes three Carrier Battle Groups, with one on station in the Indian Ocean at all times.



Composition

When completely established, the full RDF will be a powerful force in the SWA region. Current plans are for the following units to be part of the RDF by the end of Fiscal Year 1984, but some of these units have been part of the RDF since its inception. Some of the units mentioned have not yet been fully equipped or manned for their new role.

US Army

Airborne Division	1
Air Mobile/Air Assault Division	1
Mechanized Infantry Division	1
High-Technology Light Division (HTLD)	see below
Cavalry Brigade Air Combat	1
Rangers and other Special Operations Forces (SOF)	various

(at least one High-Technology Light Division is to be assigned to the RDF but division is not yet formed)

US Marine Corps

Marine Amphibious Force	1

(consists of reinforced US Marine division plus US Marine aircraft wing)

US Air Force

Tactical Fighter Wings (TFW)	7
Strategic Bomber Squadrons	2

US Navy

Carrier Battle Groups	3
Surface Action Group	1
Maritime Patrol Air Squadrons	5

Each of the three main forces (US Army, US Navy and US Air Force) has its own separate headquarters, while the US Marine Amphibious Force operates under the control of the US Navy headquarters.

For several reasons it is not possible to place precise unit allocations to the RDF. To date several units have been involved at one time or another, and the usual policy is to rotate units to and from the role for training and other commitments. It is known that units involved to date have included the 82nd and 101st Airborne Divisions, the 7th and 25th Infantry Divisions and for the US Marine Corps the 31st Marine Amphibious Unit. One known US Air Force unit is the 1st Tactical Fighter Wing at Langley Air Force Base, Virginia, which is equipped with 68 McDonnell Douglas F-15C and F-15D Eagles with their special long-range FAST (Fuel And Sensor Tactical) packs.

One other factor to be borne in mind is that the US Army infantry division is now in a state of transition from its current to a new organizational basis (Infantry Division '86). It is planned to make all current US Army units conform to the new '86 pattern, which includes a structure and equipment revision to make all the units involved more flexible and mobile while at the same time increasing their combat potential and firepower. The High Technology Light Division is a new concept being undertaken by the 9th Infantry Division at Fort Lewis, Washington. It will be an air-transportable division, without tanks and based around 10 infantry battalions, only two of which will have any vehicles. It will be an ideal addition to the RDF.

To be continued

Above: Demonstrating US long-distance deployment capabilities, men of the 82nd Airborne Division drop from C-141 StarLifters during 'Exercise Bright Star '82'. They boarded the aircraft in North Carolina.

The Bradley Fighting Vehicle system, now entering service, will act as the RDF's army personnel carrier of the 1990s.

Below: The Marines have been using the CH-46 Sea Knight for troop transport since 1965. With modifications, they are likely to be still in service at the end of the century.

Below: The Anglo-American AV-8A Harrier provides the Marine Corps with air support over areas where other jets would be unable to operate, thanks to its unique V/STOL capabilities.

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